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BIENNIAL REPORT

OF THE

60377

BUREAU OF HIGHWAYS

1895–1896.

R. C. IRVINE, MARSDEN MANSON, J. L. MAUDE,

Commissioners.

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Office of Bureau of Highways,
Sacramento, Cal., November 25, 1896.

To his Excellency James H. Budd, *Governor of the State of California:*

Sir: We herewith transmit to you the report of the Bureau of Highways, covering the work of the Bureau since the date of its organization, April 11, 1895, under authority of the Act approved March 27, 1895.

The Bureau would especially acknowledge its indebtedness to the Attorney-General, Hon. W. F. Fitzgerald, to the State Mineralogist, Hon. J. J. Crawford, to the Honorable the State Board of Prison Directors, to other State and County officials, and to public-spirited citizens throughout the State, for hearty coöperation and assistance in the discharge of its duties.

Very respectfully,

R. C. IRVINE,
MARSDEN MANSON,
J. L. MAUDE,
Commissioners.

Attest: E. Myron Wolf, Clerk.

REPORT

OF THE

BUREAU OF HIGHWAYS.

EXPENDITURES ON ROADS.

Exclusive of the sums expended on the streets of cities, towns, and even of many villages, nearly $2,000,000 were expended on the highways of the State of California during the fiscal year 1894-95. During the eleven years, from 1885 to 1895, such data as could be gathered from the records of the various county officials show that, not including private subscriptions of money, labor, and material, and poll tax, paid for generally in labor previous to 1893, and cost of construction of numerous bridges, payment for which was taken in part or in whole out of funds other than those set apart for highway purposes, the highway expenditures of the State reached the enormous sum of $18,000,000.

* * * * *

NATURAL CONDITIONS FAVORABLE TO ROAD CONSTRUCTION.

The climatic, geological, and topographical conditions in the State are exceedingly favorable to road construction. The absence of severe freezing, which works so injurious an effect upon the roads of many of the Eastern States, removes one of the greatest difficulties with which road-builders generally are confronted. The geological formations throughout the entire State furnish an abundant supply of excellent road-building material. There is scarcely a county in the State that has not within its confines, or, at any rate, close at hand, an abundance of material suitable for highway construction. The topography of the State permits of the easy location of highways along the many fertile valleys and through the intervening mountain passes.

ACTUAL CONDITION OF ROADS.

To any one familiar with any considerable fraction of the mileage of roads in our State, it is not necessary to suggest that, with the exception of certain roads which are naturally good, the roads of California are in a deplorable condition. The absolutely systemless manner in which the majority of the roads in the State have been located and constructed, and are being maintained, as well as the extensive unnecessary mileage, are evident to any one who has traveled over the State.

* * * * *

CAUSE OF OUR BAD ROADS.

All natural conditions, then, are favorable to road construction in California; immense sums of money have been raised for, and ostensibly expended upon, the highways of the State, and yet the mileage of good roads in California is deplorably meager. The query at once suggests itself, What is the cause of this condition of affairs? To this query there can be but one answer: *The work on our highways has been carried on without method or system; the money has been wastefully and injudiciously expended.*

* * * * *

THE REMEDY.

The remedy must be apparent. Changes in the existing laws alone will not suffice. Such defects as exist in these may be remedied, but until an economic and definite system of highway construction throughout the entire State be inaugurated, California can hope for no improvement over her present highway condition.

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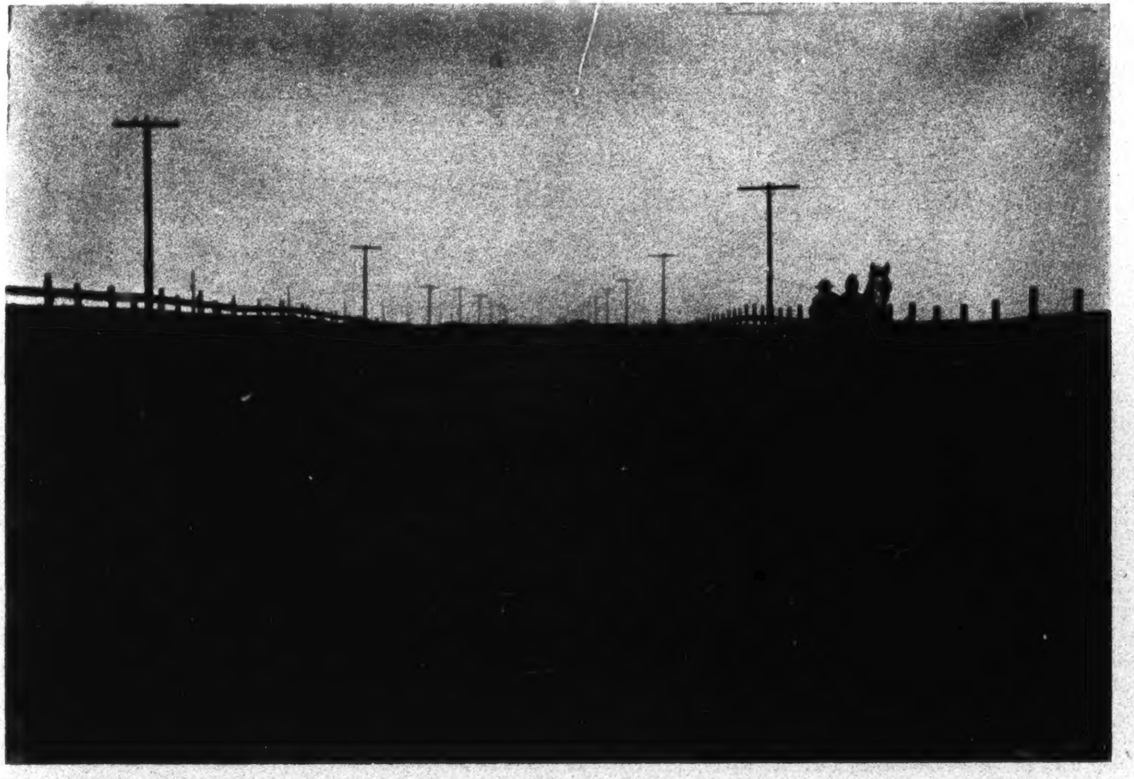
CLASSIFICATION OF ROADS.

Investigation into the experiences of European countries and of the progressive Eastern States, which show conclusively that this action must be along the lines of State management of the main highways, and consideration of the conditions peculiar to California, have led to the conclusion that the following plan would best subserve the interests of our State: The division of the roads of California into three distinct classes: (1) State highways, (2) County thoroughfares, (3) District roads.

The State highways should be the great arteries of a road system from which should branch out the minor highways serving counties and districts. They should be located along those lines which the physical features of the State forever fix as the easiest lines of communication, and should be constructed and maintained by the State. The Bureau has mapped out such a system as would traverse the great belts of timber, fruit, agricultural, and mineral wealth within our State, connect all the large

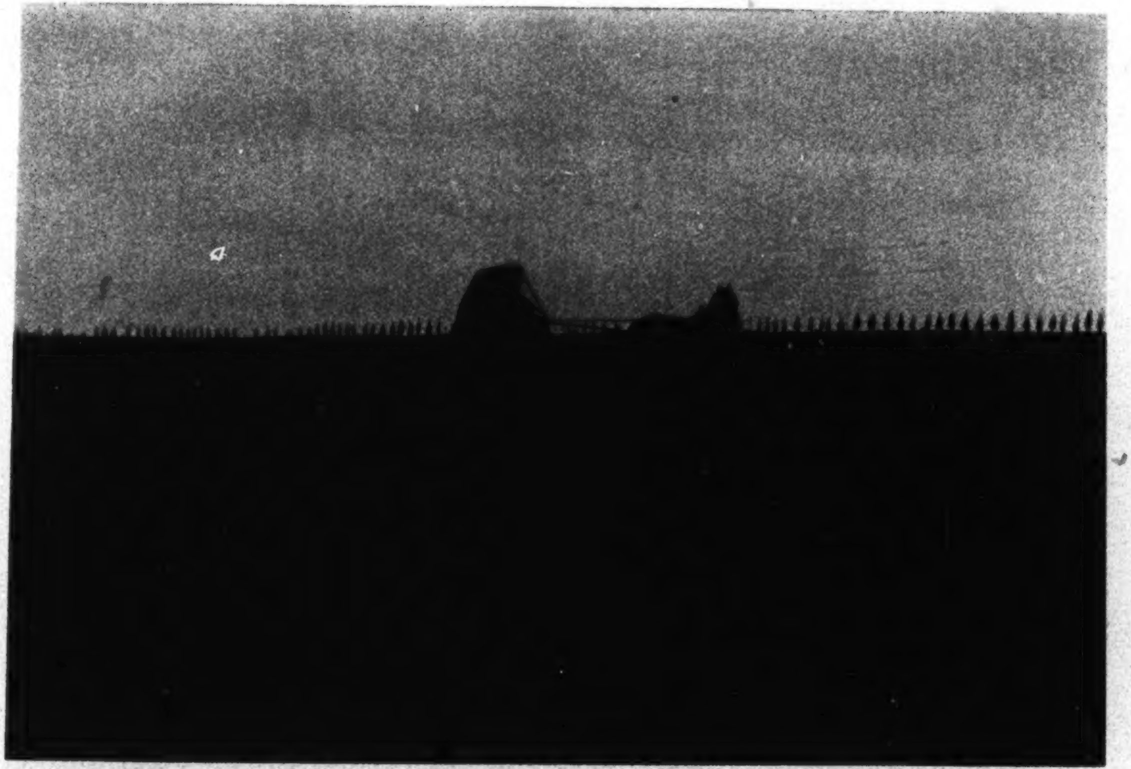


2. A Typical California Road.—Showing costly construction of a "road" which is useless for travel, and the neighborhood prefers to use the spaces on either side of the "road" rather than the "road" itself.

Photograph by Bureau of Highways.]

12. Type of Expensive Wooden Culvert.—Should be replaced with salt-glazed sewer pipe and concrete.

Photograph by Bureau of Highways.]



4. Type of Incorrect "Turnpiking".—Showing road so rounded up that it is impossible or inconvenient to travel.
Photograph by Bureau of Highways.]

11. A TYPICAL CALIFORNIA ROAD IN THE FOOTHILL REGION OF
Photograph by Bureau of Highways.]

centers of population within the limits of the State, reach the county seat of every county, and tap the lines of county roads.

The county thoroughfares should comprise the most important roads in each county, as set apart and so declared by the Boards of Supervisors of the several counties. They should be the feeders of the great State highways.

The district roads should embrace all the existing roads now recognized and set apart by law, not previously enumerated, together with such roads as may be laid out to serve the needs of particular localities.

To meet the cost of the State highways a tax levy of one quarter of a mill on the dollar of the entire assessed valuation of property in the State would suffice. The reduction of the maximum amount fixed by law to be levied for road purposes by each county on the property outside of incorporated cities from 40 to 35 cents on the $100 would offset the tax imposed. The county thoroughfares should be built by the county under the direction of the local authorities. The district roads should be constructed by the residents of the particular locality to be benefited, who should be authorized to form road districts, after the manner in which school districts are organized, and construct roads of such character as they deem necessary to suit their needs.

This classification is practically that which at all times and in all countries has been found advisable wherever road-building has been systematically undertaken, as is shown by a study of the great Peruvian and Roman systems of ancient times, and those of France, England, and other European countries, as well as those of Massachusetts, New Jersey, Connecticut, and Rhode Island, in modern times. If the plans proposed be inaugurated in our State, we should have, instead of our present utterly unsystematic methods of indiscriminate expenditure, for which comparatively little return has been made, a highway system that would place California in the rank of the progressive States of the Union and contribute more materially than any other cause to the prosperity of the State.

It was the recognition of the essentiality of good roads to prosperity and the realization of the defects of the present system, or rather lack of system, that led to the creation of the State Bureau of Highways by the last Legislature, at a time when public sentiment was unfavorable to the establishment of commissions; and likewise in other States are similar commissions being created and Good Roads Leagues are being organized, to the end that general reform of highway conditions may be brought about.

DECADENCE OF ROAD CONSTRUCTION.

The people have begun to appreciate that while our State, and indeed our country, have so marvelously progressed in all industrial wealth and methods, yet during the same period of growth, they have actually retrograded in road-building. This condition of highway affairs has been the result of over-development and over-construction along certain new lines and neglect of the older and equally needful roads.

The road system of our State has not only grown up during a period of general road decadence throughout the entire United States, but it has had grafted upon it a makeshift system from the start. The energy which led the pioneers to traverse a continent in the search of gold was coupled with a love of home which limited their contemplated stay in California to the shortest period possible with the acquirement of wealth. They were, therefore, content with trails, roads, and bridges which were essentially temporary or makeshift in character. Consequently, our people have learned to regard road building and maintenance as the result of temporary expedients resorted to only when forced by necessity. In some instances where wise forethought has prompted permanent work and materials, the step has been regarded as an expensive "experiment," and the officials inaugurating these improvements have been accused of extravagance.

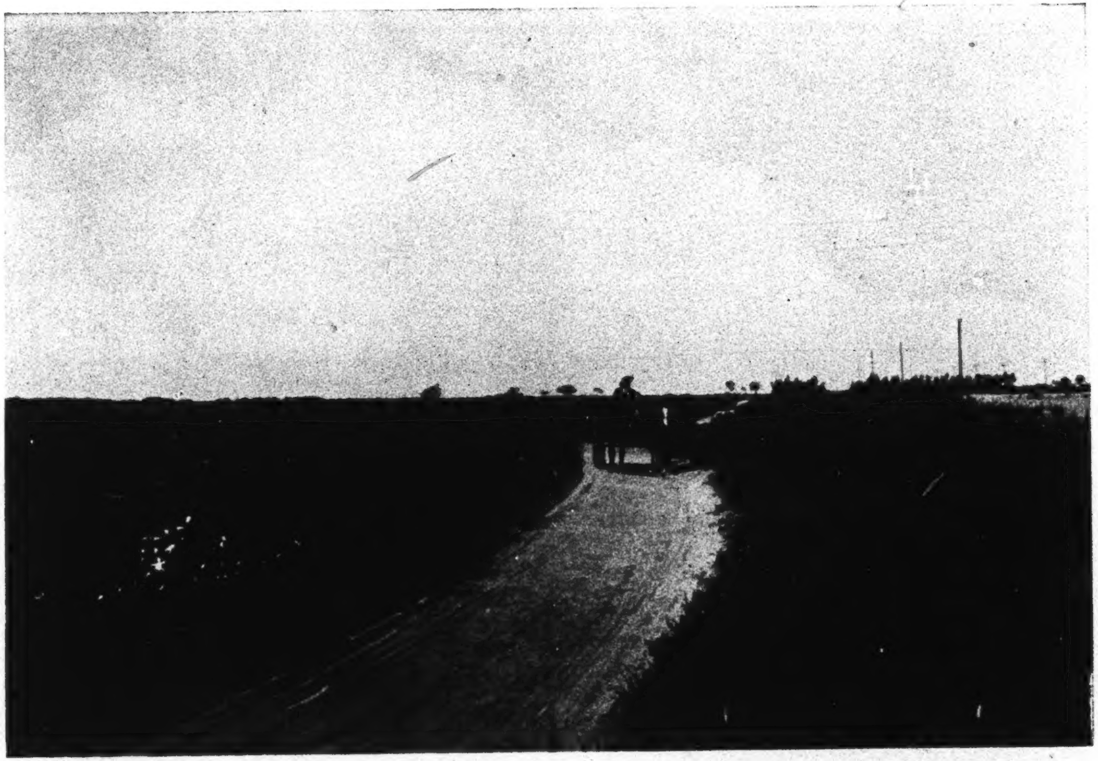
In the early part of the century, the prosperity and development succeeding the War of the Revolution required ample and extended means of communication. The common roads of the country were supplemented by toll roads, which were built by companies on franchises granted for variable periods. These toll roads were frequently built of plank, but generally of earth and gravel. The exactions for toll, possible under these monopolies, became so burdensome that great complaint was made, and the franchises and property of the toll companies were sometimes purchased by the State and county authorities. The recent experiences in Kentucky, with the attendant outbreaks on the part of the people, are but fair examples of numerous occurrences more or less general in earlier times.

The necessities for cheap transportation became so great that the Congress of the United States, Cabinet officers, the President—in fact, almost all of the functions of the National, State, and County governments—were engaged in the study and practical application of the science of road-building. Reports of Cabinet officers, messages of the Presidents, and the views of the leading statesmen of our country, bearing on this subject, are very common in Government documents during the early decades of this century. Notable among these are:

1. The Act admitting Ohio in 1802, and setting apart five per cent

11. A Typical California Road in the Foothill Region of the Sierras.

Photograph by Bureau of Highways.]



6. Showing Continued Neglect and Wear of Road below the General Surface—Causing the road to serve as a drainway rather than as a hard, well-drained surface.

Photograph by Bureau of Highways.]

of the sales of public lands as a road construction fund. These sales netted something over three quarters of a million dollars in a few years.

2. The bill introduced by Mr. Tracy, of Connecticut, approved in 1806 by President Jefferson. The debates on this Act show how deeply the road question interested our country.

3. The speech of Mr. Calhoun in favor of placing the bonus on all bonds sold and dividends of the national banks in a fund for the construction of roads and canals; this fund would have amounted to nearly three quarters of a million annually. This bill was, however, vetoed by President Monroe in 1817, on the ground that it was unconstitutional, even if the States gave their consent to the provisions of the law.

An extensive system of roads was projected and partly constructed by Congress. The most noted were the "National Turnpikes" in Maryland, Virginia, Pennsylvania, and Ohio, which aggregated several hundred miles and received Congressional appropriations aggregating $7,000,000, in annual appropriations of from $30,000 to $500,000.

Finally, in 1834–35, an appropriation of $300,000 was made for repairing the National roads in Pennsylvania, Maryland, and Virginia, and when repaired they were transferred to these States.

Just as road-building became a science, fostered by our Government, and placed in the hands of skillful engineers, the invention of the locomotive and the consequent development of railroad-building came about. At once all the energies of our people were centered upon this new mode of transportation. So great was the impetus thus given, that the United States soon ran far ahead of other countries in mileage of railroad. For generations the building of roads was forgotten, and the building of railroads stimulated and fostered. The highest skill of trained engineers of the country has been and is employed in the general and special work of building, equipping, and operating railroads.

During this period of railroad growth and development, roads have been neglected to such an extent that generations have grown up that have never seen a road. They have learned to speak of streaks of dust or mud, as the case may be, as roads—have actually learned to regard them as such, and solemnly dedicate the same to public use, with all due legal form, as if they really were well-located, graded, drained, and thoroughly metaled highways. The engineers of the country have so seldom, until lately, been employed on road work that they, too, have looked upon road-building as a lost art, which at one time was practiced by the ancients. But of late years the wave has turned; the people have begun to realize that in good roads there is an escape from the heavy burdens they now bear in maintaining and operating bad roads, and that a real, positive source of wealth is within their control and reach.

UTILITY OF AND DEMAND FOR GOOD ROADS.

Nowhere can this be more clearly shown than in California. Every industry of the State finds its heaviest burdens incident to bad roads. The *farmer* is taxed more heavily in hauling his grain from the field to the depot than in transporting it from the depot to the ship. He is therefore beginning to realize that it is economical to construct a good road, that will permit of hauling four or five tons per span of horses, rather than to pay the cost of hauling one ton, or less, per span of horses upon a bad road. He is learning to appreciate the fact that a good road, that will permit of travel throughout the entire year, does not cut him off from communication with the rest of the world during the winter season, and thereby tends to make farm life more attractive to his family. The *miner* finds that his teaming bills largely tax the wealth he extracts from the earth. The *fruit-raiser* and the *vineyardist* are compelled to bear a heavy tax in the loss resulting from the dust and bruising incident to bad roads. The *teamster* is taxed by having to haul light loads, feed a greater number of animals, and pay for heavy repairs. The *merchant* finds that the absence of such roads as will permit of travel throughout the entire year deprives him during the winter season of the trade of the farmer, the horticulturist, and the miner. *Liverymen,* with large sums of money invested in horses and conveyances, and *breeders of fine stock,* find their capital uselessly invested because of the absence of good roads inviting pleasure-seekers to drive. The *railroad and steamship transportation companies* realize that good roads are a benefit to them, in that they develop the various industries of the State, and permit of the shipment of greater quantities of merchandise, much of which is distinctively Californian, by virtue of the reduction of the cost of hauling to the shipping-point. The desire for improved highways on the part of *those who use the roads for pleasure* is so generally recognized as to require no comment. Those who delight in driving fast horses, or who seek recreation from busy city life in rural or mountain seclusion, have made their desires in this connection thoroughly known. The important part played by the *manufacturer and numerous riders of bicycles* in this agitation for good roads has been and is being so constantly manifested that an impression has arisen that this movement, instead of representing the sentiment of every diverse interest of the State, is solely a cyclists' agitation.

The fact is, that the industrial development of our State has nearly reached the limit possible with bad roads. If it is to progress further, it must have, as a basis, the economic and systematic administration of highway affairs. This administration must extend from the first principle of locating a road upon the best grades and alignments, through every detail of thorough construction, to careful and faithful maintenance. To be lax in any particular is to relegate these important matters

5. TYPE OF ENCROACHMENT UPON RIGHTS OF WAY.—Highway too narrow for teams to pass.
Photograph by Bureau of Highways.]

3. Typical Method of "Grading" a Road so as to Render It Useless—Forcing teams to use the shallow ditches on either side of the road,

Photograph by Bureau of Highways.]

to the conditions now existing. It is the realization of these truths which has manifested itself in the great interest in the "Good Roads" movement by individuals, societies, and general and special organizations throughout the United States, as well as in the political platforms of the various parties.

Evidence of the need for reform of the highway system of this State is afforded by a consideration of the constant tinkering with the road laws of the State. Every session of the Legislature has brought about the introduction of all kinds of measures, each aiming, perhaps, at a praiseworthy effort to rectify the faults that have manifested themselves in different localities, but resulting only in still greater confusion. To ascertain all the highway laws now in force, to segregate those ineffective and obsolete from such as are effective, was one of the duties imposed by the Act creating the Bureau.

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DUTIES OF THE BUREAU OF HIGHWAYS.

It was under the authority of this Act, approved March 27, 1895, that, on the 11th of April, 1895, the Bureau of Highways was organized. The Act required a broad and exhaustive study, first, of the laws appertaining to highways in this and other States; second, of the physical features of the State and their relation to a system of roads; third, of the economic and legal status of the highway conditions in each county in the State, and the presentation of the facts and conclusions reached in the form of a report, recommending such measures as the Bureau deemed advisable. The law also required that one or more members of the Bureau should, during each of the two years of the existence of the Bureau, visit each county in the State, and hold public meetings for the consideration and discussion of matters pertaining to highway improvement.

* * * * *

TRIPS OF INSPECTION AND VISITS TO COUNTIES.

In carrying out the provisions in reference to visiting counties, the Bureau determined that, as the Supervisors and Surveyor of each county were directly concerned with the matter of highway improvement, and as power was given the Bureau "to call on the Clerk of the Board of Supervisors, Surveyor, Auditor, or any other official for such assistance as may be necessary for gathering the information it may desire," the public meetings should be held with these officials. Accordingly, in arranging the visits, the Clerk of each county was notified of the date of the proposed visit to his county, and requested to secure the presence of the officials particularly specified, and to invite, through the medium of the press, all persons interested in road matters. In the first year of the Bureau's official existence, it was aimed by the Commissioners to drive together, as far as possible, or to so arrange their visits that each Commissioner might travel over that portion of the State with which he was least familiar, to the end that each might secure a thorough knowledge of the conditions of the State, and thereby be better enabled to arrive at a feasible solution of the immense problem with which the Bureau was confronted. Believing that its duties would be discharged to a better advantage by driving over the roads, and thereby being brought in actual contact with their condition, the Bureau purchased a team of horses and a wagon, and during the first year traveled over the following distances: Commissioner Irvine, 3,000 miles; Commissioner Manson, 2,818 miles; Commissioner Maude, 1,950 miles. The official meetings were held on the dates indicated in the appended report on the conditions encountered in each county. During the second fiscal year, the State was districted, Commissioner Irvine traveling over the northern portion, covering 3,500 miles; Commissioner Manson over the central portion, covering 4,262 miles, and Commissioner Maude over the southern portion, covering 1,300 miles. Again all traveling was done by means of team, and the attention of the Commissioners was particularly directed to gathering the data herein contained.

In addition to these meetings with the county officials, several other public meetings were held in different communities, principally under the auspices of various organizations for local improvement.

In accordance with the instructions of the Governor, who is ex officio President of the Board of Yosemite Valley Commissioners, the three Commissioners of the Bureau left Sacramento on the 31st of May, 1895, to meet with the Yosemite Valley Commissioners at their annual session held in the valley on the 6th of June. As a result of this trip of the Commissioners of the Bureau, a report on the highway condition of the valley, containing recommendations deemed advisable, was filed with the Governor.

Addresses on matters pertinent to highway affairs were delivered by different members of the Bureau at meetings held under the auspices of the Chamber of Commerce of Los Angeles, the Chamber of Commerce of Eureka, the Elk Grove Grange, the Students' Engineering Club at the Leland Stanford Jr. University, Stockton Commercial Association, Santa Cruz Good Roads Association, as well as at a meeting arranged by the citizens of Redding, and at one held in San Francisco under the auspices of the Highway Improvement Committee of the League of American Wheelmen, assisted by the various Improvement Clubs, the Merchants' Association, Butchers' Board of Trade, Technical Society, Scavengers' Union, and various bicycle organizations. On the occasion of the Commissioners' visits to San Diego, Tulare, and Alameda counties in each year, meetings held under the auspices of the Wheelmen's Club of San Diego, the Tulare Grange at Visalia, and the Alameda Good Roads Association in Oakland were addressed. The Bureau was also represented at the recent dedication of the stone bridge near Monticello.

At the meeting of the Supervisors' State Convention, held in San José on May 11, 12, 13, 1896, the three Commissioners were present, delivered addresses, and participated in the deliberations.

On the 23d of March, 1896, the three Commissioners addressed a meeting in Sacramento, held under the auspices of the Capital City Wheelmen. On account of the peculiarly favorable conditions for the construction of such a highway, and in the hope of seeing a road properly constructed which might serve as an object-lesson to all other road-builders in the State, the Bureau endeavored to induce the citizens of Sacramento County to build a road between Sacramento and Folsom. The suggestion was made at this meeting, and on the 16th of May a meeting was held in the office of the Bureau for the purpose of arranging preliminaries to the construction of such a road. Another meeting was held by the citizens of Sacramento in the court-house on the 22d of May, which the Commissioners addressed, and subsequent meetings were held at Mills (Hangtown Crossing), Florin, and Folsom, for the purpose of arousing the interest of the people in the proposed highway. A plan was decided upon which provided for a contribution of $5,000 from the City of Sacramento, to be raised by issuance of bonds, but the City Trustees refused to submit the matter to the people, and consequently all action toward securing the construction of the road was dropped.

It was found in these visits that the sentiment of the people generally was aroused to the necessity for prompt reform of the highway regulations, and this encouragement from the people generally and the practically universal indorsement of the press have led to the conclusion that the time never has been, and probably will not again be for several decades, so favorable to legislative action as the present. As the result of the first year's travel and investigation, a crude plan, substantially similar to that previously outlined, and more accurately defined in the following pages, was determined upon as the line of action along which California must move in the betterment of her highways, and all subsequent investigations and considerations have served to confirm and strengthen those convictions and to bring out the details of the plan proposed.

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DIFFICULTY OF SECURING ACCURATE DATA.

In gathering the data which is presented largely in Tables 1 and 2 and in the detailed description of each county given in Appendix A, the Bureau has been seriously handicapped by the lack of a definite business-like system on the part of the counties in keeping account of expenditures and preserving records. The need of the introduction of a system of general book and record keeping for every county in the State was made clear. The law required that the Bureau ascertain the amount expended for highway purposes during the past ten years, but in the majority of the counties the absolute impossibility of obtaining anything like an accurate knowledge of the expenditures presented itself. The accounts, as a general thing, are not kept in such form as to put on record the work, materials, and cost of any definite piece of work, as should be done in every case.

In most of the counties there exist the recorded data, through which can be ascertained, in a general way, the amounts expended upon all the county roads. But this is not in such condition as to show, even in general, what has been accomplished. In some, the mode of keeping accounts has been so lax that it is impossible to ascertain what amounts have been collected and expended upon roads, and the figures given are sometimes based upon the property values and tax rate, with a percentage deduction for delinquent taxes.

In the case of definite contracts for a specified amount of work upon fixed grades, the contractor has been frequently allowed to change the grade and alignment to his advantage and against the interests of the public. This is possible by reason of the absence in the law of any provision which requires the County Surveyor to certify whether or not the work has been done in accordance with the contract before payments have been made. It is, therefore, a matter of great difficulty to ascertain the amounts of money expended by the various counties, and an impossibility to approximate, except in a general way, the extent and character of work done.

In the crude and disjointed shape in which the Bureau has found many of the records of highways, it has been impossible to gather accurate statistics. In the majority of counties the records are in such condition as to cause grave doubts as to the ownership of the right of way over a large percentage of the mileage of roads. In fact, it is only to some of the roads laid out in recent years that deeds to the rights of way have been secured. The roads laid out at an earlier date are used simply by prescription. Some have also been illegally and informally altered, shifted, or fenced up, with no record or evidence whatever of the act, except the visible evidence at the locality and the memory of witnesses. In these changes the public has suffered by the shifting of the road to more difficult ground upon which to build and maintain a road. One of the many instances of this kind is cited to illustrate how the public rights have been pushed aside for purely personal and selfish ends. The ultimate evil can only be realized when it is considered that for the purpose of gratifying the selfish ends of individuals the people have been compelled to construct roads over difficult and faulty locations, and are asked to maintain and operate these roads for all time, when the interests which instigate and inflict this wrong can last but for a generation or two at most. These relations have not been fully and clearly considered in permitting these evils, but have been speciously glossed over, with the invariable result that the people's interests suffer.

The road from Lakeport to Upper Lake, for example, was originally well laid out; it was located on a nearly direct alignment upon gently sloping and easily drained land lying along the base of a series of broken clayey hills west of Clear Lake. First one and then another of the land-owners shifted the road westerly over the uneven and difficult hill land, until the additional length of road is about two miles, and the road lies along the edge and over the miry slopes of the adjacent hills in a faulty and difficult location. The original right of way has been forfeited by these actions for a distance of eight miles, and to recover it would cost the county nearly $20,000. This instance is cited as one of many, and will be recognized as a type of similar actions in nearly every district in the State.

These evils are, however, decreasing, and a broader sense of public need is being entertained; they can gradually be eradicated by a just and equitable administration of highway affairs and by the unselfish consideration of the rights involved by land-owners.

It has been difficult to ascertain the mileage of roads in each county of the State, for although the law prescribes that the roads must be surveyed and recorded, it has been carried out accurately only in a few counties. The tables appended give 45,056 miles as the approximate mileage now existing. It is not possible to ascertain what portion of this is unnecessary. As the law now stands there is no classification of roads, and each mile is entitled under the law to the same consideration. This defect in the law is, however, partially remedied by the recognition by county officials of the necessities of each case, and by the expenditure of highway funds in such a manner as to partly meet these necessities.

There are, in many counties, miles of expensive roads which principally serve interests beyond their borders, but upon which no money can now be expended from the industries and communities vitally interested.

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ROCK-CRUSHING PLANT.

Another duty devolving upon the Bureau of Highways was that of receiving the orders for highway metal from the rock-crushing plant at the Folsom State Prison, which was erected in accordance with the provisions of the Act approved March 28, 1895. The Governor, the Board of Prison Directors, and the Bureau of Highways were authorized to act jointly in the establishment and operation of the plant, and at a joint meeting held in the Governor's office on the 6th of July, 1895, it was determined to proceed with the establishment of the plant. From inquiries received, it was clear that sufficient quantities of the metal would be ordered to justify the establishment and operation of the plant, and the Southern Pacific Company had generously agreed to haul the metal at the actual cost of transportation, the rates ranging from three quarters of a cent to one cent per ton per mile.

On September 28, 1895, the Board of Prison Directors and the Bureau of Highways met jointly at the Folsom State Prison and opened the bids for the construction of the plant, which had been previously advertised for, and at an adjourned meeting held in San Francisco on October 2, 1895, the contract was awarded to the Union Iron Works. In accordance with the opinion rendered by the Attorney-General, that metal could be supplied only to those using it on public highways, the proper blanks so certifying were prepared by the Bureau, and are required to accompany each order. It was determined at a joint meeting of the Board of Prison Directors and the Bureau of Highways that the metal should be supplied at the rate of 25 cents per ton, and money in payment for each order in advance should be received by the Bureau and transmitted to the Warden of the Folsom State Prison. Up to November 12, 1895, orders for 49,072 tons have been received at the office of the Bureau, and $12,295 66 has been remitted in payment of the amount ordered and of 110.64 tons sent in excess of orders.

It was the unquestioned intent that the highway metal should be utilized on country highways; but the Supervisors of those counties to which the Railroad Company had given the advantage of cheap rates have failed to respond, notwithstanding urgent advice given by the Commissioners on the occasion of their public meetings that they do so, and circular letters sent from the office of the Bureau to the same effect. The cities, however, have responded eagerly, and more than taxed the capacity of the crusher with their orders for the metal to be used in improving their streets. Stockton, Sacramento, Marysville, and Vallejo have taken the greater portion of the output, the first-mentioned city leading all the rest.

* * * * *

REVISION OF ROAD LAWS.

In the consideration given to the road laws of the State, the presence of many conflicting sections in our Code was soon demonstrated, as will be found by consulting Appendix B. The Bureau has aimed to harmonize these, and made such other changes of minor importance as are at present deemed necessary. One great defect encountered was the failure of the law to prescribe penalties for non-compliance with statutory regulations. In numerous instances, as, for example, those prescribing the erection of guide-posts, the keeping on record of maps, etc., wherein the law clearly defines the duties of the Supervisors, absolutely no attention is paid to the legal requirements, and there appear to be no means either of compelling the Supervisors to discharge their duties clearly laid down or of punishing them for their negligence.

The Bureau has been frequently called upon to furnish different localities with specifications, cross-sections, and general advice, and these requests, when reasonable, as they have been in the majority of cases, have been cheerfully complied with.

The Bureau has found it impossible, in the limited time and with the vast amount of data it has collected, to prescribe more exact forms and methods for both accounts and records, but hopes to be able, before the expiration of its period of existence, to submit such forms as will systematize these important matters.

* * * * *

ROAD LAWS OF OTHER STATES.

Another of the duties of the Bureau requires that inquiry shall be made into what laws and methods are in use in other States in regard to road matters, and that an abstract of those best adapted to the State of California be made. In the hope of arriving at a more thorough knowledge of the exact conditions in each State of the Union and the more progressive foreign countries, direct correspondence with the States and countries was entered into. Replies were received from England, France, Germany, Belgium, and from nearly every State in the Union. In a number of States, commissions, with duties similar to the present Bureau of Highways of California, have been organized, and are expected to be made permanent bodies. In many of those States in which such action has not been taken the replies received indicated that, in deference to the popular sentiment, such a line of policy would inevitably be inaugurated. In some States, as the pages immediately following will show, there have been established permanent bodies, charged with the administration of highway affairs.

Upon the decision of the Board of Examiners that the appropriation of the Bureau could not be used for such traveling, Commissioner Maude, at his own expense, attended the National Road Parliament, called by the United States Government, to be held at the Cotton States Exposition at Atlanta, Georgia, on the 17th, 18th, and 19th of October, 1895. The convention was attended by representatives of forty-two States and Territories; tests of road machinery were made, and samples of various kinds of roads were built and traction tests made thereon. It was decided at this convention that the system of State highway construction in vogue in Massachusetts was the most advantageous for general adoption.

In all this correspondence, and at the National Road Parliament, considerable interest was manifested in the action to be taken by California, due, in all probability, to the proverbial enterprise of our State, and to the statement made by General Roy Stone, Chief Engineer of the Office of Road Inquiry, under the Department of Agriculture, that "California should lead the world in highways."

The necessary solution of the problem of improving the highway conditions in this State involves some phase of State management. In view of this fact, the considerations of the Bureau as to what has been done in other States have been chiefly directed toward those States which have taken the lead in the matter of State management of roads.

The difference in conditions in these States, as compared with those in California, however, makes it manifest that different regulations must be introduced here, although the success attending the introduction of the plan of State management in other States leads inevitably to the conclusion that the work must be along the same lines. When we consider that the States of New Jersey, Massachusetts, Rhode Island, and Connecticut operate under constitutions much more elastic than does our State, and that the areas of these States are 7,455, 8,040, 1,085, and 4,845 square miles, as compared with an area of 155,980 square miles for California, it is apparent that different regulations must prevail here.

The first State highway law passed in New Jersey, in 1891, provides that upon the petition of the owners of two thirds of the land bordering on a road, to the effect that they are willing to pay 10% of the entire cost of improvement, the Board of Chosen Freeholders must cause the road to be improved, if the estimated cost of improvements does not exceed one half per cent of the ratables of the county for the last preceding year. The board must then cause specifications for stone, macadam, or telford roads to be prepared, and must order the survey to be made. One third of nine tenths of the cost of such road is to be paid by the State, the Freeholders certifying two thirds of the estimated cost, less the one tenth paid by the property-owners, to the County Board of Assessors. The sum paid by the State is not to exceed $75,000 per year.

The enforcing of this law devolved on the President of the State Board of Agriculture, but by amendment, in 1894, the position of State Commissioner of Public Roads was created, and the results to the State have been thoroughly satisfactory.

The record of the legislation in the State of Massachusetts in regard to the State management of highways is interesting. The first Act was passed in 1893, and provides that the commissioners of the county might petition the State Highway Commission, created by the Act, and consisting of three members, that the commonwealth acquire as a State highway a new or an existing road in that county, definitely specified and described, with plans and profiles. If the Highway Commissioners

9. Nantucket Milestone Road in Massachusetts, Showing Old Town or County Road.

10. The Same Road Reconstructed Under the Supervision of the State Highway Commission of Massachusetts.

From Photographs furnished by the Massachusetts Highway Commission.]

approve the petition, the County Commissioners cause the road to be surveyed and laid out at the expense of the county. The State Commissioners then present the petition, with their approval thereon, to the Secretary of the Commonwealth, who places the matter before the Legislature, which meets annually. If the Legislature make an appropriation for the construction of the road, the State Commission causes the road to be constructed, and, when completed and approved, the road becomes a State highway, to be maintained by the commonwealth, under the supervision of the Commission. The Act also provides that two or more cities or towns may petition the Commission that the commonwealth acquire as a State highway a new or an existing road leading from one city or town to another, plans and profiles accompanying the petition. If the petition be approved, a copy, with the finding of the State Commission, is given to the County Commissioners, who then cause the road to be laid out and surveyed at the county's expense. The State Commissioners then transmit the petition to the Secretary of the Commonwealth, and the subsequent proceedings are as described. All grading and the construction of culverts and bridges must be paid for by the county or counties in which the highway lies, and the work must be done to the satisfaction of the Commission. The fund which the State makes available is utilized exclusively for the metaling and construction of roads.

The amendments made to this Act in 1894 are significant, first, in that they give the State Commission authority to construct, not only country roads, but city and town streets, under the conditions with reference to petition previously described; and secondly, that an appropriation of $300,000 is made. The cities or towns are given the right to contract with the commission for the construction of so much of the highway as lies in their limits, without advertising; not more than ten miles of State roads are to be built in any county in one year without previous approval, in writing, by the Governor and Council; one fourth of the money expended in any county by the commonwealth for a highway under the provisions of this Act must be repaid to the commonwealth within six years, at 3% interest, and these sums so repaid are applied to the appropriation to be expended by the commission. The appropriation is in the form of a "State Highway Loan." The Act authorizes the Treasurer to issue, with the approval of the Governor and the Council, scrip, or certificates of indebtedness, to an amount not exceeding $300,000, for a term not exceeding thirty years. These are issued as registered bonds, or with interest coupons attached. They are sold at public auction or otherwise, and a sinking fund is established, into which premiums on the sale of the bonds and proportioned amounts are paid to extinguish the debt. The amount necessary to meet the sinking fund requirements is raised by taxation from year to year. The success attending the introduction of this plan of State regulation of highways is clearly shown by the action of the State Legislature. In 1895, the appropriation for the construction of State highways was increased to $400,000 for that year, and in 1896, to $600,000.

In 1895, Connecticut introduced a plan of State highway management. The Act passed in that State provides for the appointment of three commissioners, to whom, whenever any town votes its intention to cause a road to be improved under the provisions of the Act, the specifications prepared and the surveys made by the selectmen of the town must be submitted. If a majority of the commission approve the specifications, the selectmen advertise for bids. The commissioners supervise the contracts and the construction of the road. One third of the cost of the roads is paid by the State, to an amount not exceeding $75,000 per year, one third of the cost by the county, and one third by the town within which the road is constructed. The town must keep the road in repair.

In the same year, Rhode Island passed an Act providing for the appointment of a State Commissioner of Highways, who must be a civil engineer. Whenever a town council or board of city aldermen represent to the State Commissioner the need of repairs to any road, the State Commissioner must examine the premises, and if he deem the work necessary, he must prepare plans and estimate the cost, reporting to the council or board of aldermen and also to the General Assembly. He must recommend what proportion of the expense should be borne by the State and what by the town or city. If his recommendation be approved by the General Assembly, the Commissioner causes the highway to be built by contract, and then apportions the expense to each town or city.

The excellent road systems of Rome and Peru, and the important part they played in developing the wealth and power of these ancient nations, are known to every student of history. France, England, and other European nations have developed systems that are worthy of the emulation of the other nations of modern times. Of such importance are the roads of France considered that the chief executive officer is a member of the Cabinet. To no one cause is the general prosperity of the French people more directly attributable than to the excellence of their highways.

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POLITICS IN ROAD-BUILDING.

The conditions which have for years demanded an investigation into highway matters in this and other States, have resulted from the fact that the people were so eager in developing other lines of wealth that road-building has been neglected for several generations. The condition of highways in California to-day is the result of generations of neglect and apathy. Not only has this been the case, but an unfortunate outgrowth of our system of government has permitted the injection of politics into the business management of economic matters of great importance to the industrial development of our country. In too many instances the road funds have been regarded as the funds from which to pay political debts, or to be used about election times to further political interests. In several counties the Bureau has ascertained that officials have selected for employés on roads those owing them for merchandise, food, board, or drinks. Large bills have thus been incurred by the county, and personal indebtedness indirectly paid from public funds, with a bare pretense at an adequate return therefor. The evils thus introduced have been accumulative from year to year, from term to term, and, indeed, from generation to generation.

To correct these evils will require comprehensive and intelligent legislation and administration, extending over many years. The Bureau believes that it has succeeded in laying the foundation for a great system of highways, which, under judicious management, will, from year to year, grow in its capacity to develop the wealth of the State.

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HIGHWAY EXPENDITURES IN CALIFORNIA.

Before considering the details of the plan herein recommended, it should be borne in mind that there has been expended upon the county roads in California, as will be seen by consulting the tables published herewith, during the years 1885 to 1895, inclusive, the sum of $17,919,824 26, and that during the fiscal year ending July 1, 1895, $1,789,259 64 was similarly expended. As previously stated, these sums are less than the actual amounts, because county records are in such condition that it is impossible to get exact figures. It frequently happens that bridges and other structures are paid for, in whole or in part, out of other funds than those set apart for highway purposes. It has been impossible for the Bureau to trace these expenditures fully in the limited time set apart for its studies of this matter. Again, subscriptions by private parties are frequently made, and no account thereof is kept in the official records of expenditures. These in the aggregate amount to many thousands of dollars annually. There are also made large subscriptions of labor and materials, of which no definite records or accounts are kept. These two items would, if ascertainable, bring the expenditures of 1895 up to $2,000,000.

The results obtained by these vast expenditures have been insignificant in the extreme. To contemplate the fact that, in the period embraced in the years 1885 to 1895, inclusive, at least $18,000,000 of the people's money has been expended, and that no adequate return therefor is apparent, not only lays bare the inadequate and inefficient methods now in use, but it almost arraigns the intelligence of the people. It will be necessary to maintain existing roads, as the needs they serve are imperative, but a saving must and can be effected. The existing roads should be maintained, through system and economy, with a sum not to exceed 75% of the present rate of expenditure. It is the opinion of the Bureau that even a less sum would be sufficient. But granting the large sum as necessary, would still leave 25% of the sum expended during the past decade, or $4,500,000, available for the systematic construction of permanent roads.

There is hardly any need to state that these vast expenditures have been made in a manner extravagant and wasteful in the extreme. The numberless minor instances which have been brought directly before the Bureau sink into insignificance in comparison with the vast figures given; but the Bureau has numerous instances which, although small, distinctly mark the wastefulness of the system and the uselessness of some of the expenditures.

The only reason why these expenditures have not bankrupted the counties of our State is the fact that these moneys have generally been paid to residents of the State, and have thus not escaped from our limits. The evil of the system lies in the fact that no adequate return has been made to the people for the amounts they have been called upon to expend.

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REFORMS RECOMMENDED.

The Bureau recognizes that, in the existing industrial conditions, it would not be wise nor just to advocate an increase in the maximum tax rate now authorized for highway purposes. The true way to lessen existing evils is to reduce and equalize the rate of present taxation and to expend *economically* and *wisely* the amounts raised. It is therefore recommended:

1. That the limit of taxation for highway purposes in each county, now fixed by law at 40 cents per $100 of assessed valuation of outside property, be reduced to 35 cents;

2. That a general State levy of one quarter of a mill per $1 of assessed valuation be made, the proceeds of which shall constitute a State highway fund for the systematic location, construction, and maintenance of the system of State highways hereinafter outlined.

Under this system every taxpayer in the State will contribute to the construction of these main highways. At present only those owning property outside of incorporated cities are called upon to bear the expenditures on roads; but under the plan recommended those owning property solely in the cities, and who are likewise benefited either directly or indirectly, will bear a slight share in the cost of this needed improvement. The amount is infinitely small, but the results will be of tremendous advantage to the entire State. The counties will gradually be relieved of the expense of maintaining that portion of the State highways within their limits, thus leaving a larger sum for their county thoroughfares and district roads. These latter, by proper construction, will gradually require smaller expenditures for maintenance, so that the system proposed herein, and found advisable in other States and countries, *will tend to lessen the burdens now endured.*

Although the system of State highways recommended seems a gigantic undertaking, it is reasonably certain *that it can be built within the next few decades with what can be saved from the present extravagant and wasteful methods.*

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THE STATE HIGHWAYS TO TRAVERSE GREAT BELTS OF WEALTH.

In laying out the system which the Bureau recommends, consideration was taken of the fact that our State has primarily four great belts of natural wealth. In progression eastwardly and order of development, these are: First—The great mineral belt, commencing in Del Norte County, and reaching southeastwardly through the entire limits of the State;

Second—The great agricultural belt of the 16,000 square miles of fertile land in the great valley of California;

Third—The great timber belt, commencing in the northwesterly corner of the State, and extending southeasterly to the Golden Gate;

Fourth—The great fruit belt, commencing at the base of Mount St. Helena and extending southerly through deciduous orchards, vineyards, olive and orange groves to the national boundary.

Each of these great belts is interspersed with sources of wealth other than those which characterize it; but the classification given marks the predominant natural wealth of each of the various sections.

At advantageous points along each of these great belts, centers of population are growing up. The problem of laying out the great lines of communication which must for all time control the travel and traffic of our State therefore presents itself. These lines have a simple function to perform, but must be subservient to two great controlling factors: First, they must lie along those lines, determined by nature, which offer the best grades and alignments; second, they must subserve the economic purposes demanded in the development of the State.

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COMMERCIAL NECESSITIES FOR STATE HIGHWAYS.

In addition to these reasons urged in favor of the construction of State highways, it must be borne in mind that many counties too poor to properly construct and maintain permanent highways, are traversed by roads of importance to the entire State. A vast amount of business that should be transacted with the commercial centers of our State is diverted to our northern and eastern neighbors, simply on account of the lack of requisite means of communication. The remedy for such a condition of affairs cannot be expected of a county which will receive no direct benefit and which, as is generally the case, has scarcely sufficient funds for affairs of local and urgent necessity. The entire State is either directly or indirectly interested, and the benefits that would accrue would be not of avail simply for a particular county, but would aid in advancing the commercial interests of the entire State.

Numerous examples might be given of such a condition of affairs. A road over the Tejon Pass, at the southern end of the great valley of California, would connect this important section of the State directly with the growing interests south of Tehachapi. Its length would be about 70 or 80 miles, and its construction costly. Owing to the lack of population in those portions of Kern and Los Angeles counties directly brought in contact with the highway proposed, this advantageous improvement cannot be inaugurated. The necessity for such a measure as proposed again impresses itself when it is found that, after traveling north of the latitude of Ukiah on the western side of the Coast Range, and that of Colusa on the eastern side, there is absolutely no road upon which to cross from one side to the other until the traveler reaches Grant's Pass in Oregon, a distance of 225 miles. A highway connecting Red Bluff, at the northern end of the great valley and the head of navigation of the Sacramento River, with Eureka, in Humboldt County, would result in immense advantages to two important sections of the State. But even assuming that the counties through which such a highway must pass were to act jointly, it would be found that while Tehama might be able to afford to build that portion of the highway within her confines, and Humboldt that within her county, the sparsity of population and consequent lack of funds of the intervening county of Trinity would prevent the completion of the highway. A similar state of affairs is presented after the necessity of another highway in a northeasterly direction from Red Bluff is made evident. Again, the great advantages that would follow the construction of a highway from some point at the southern end of the great valley of California to tidewater, as from Bakersfield to Port Harford, are clear, but the sparsity of population in Kern and San Luis Obispo counties and the inevitably consequent lack of funds render it impossible without some form of aid from an external source. The fact that two of the Commissioners were compelled, in each year of the Bureau's existence, to travel into Oregon a distance of 125 miles, and into Nevada a distance of more than 200 miles, in order to visit each county of the State, is further evidence of the necessity for State construction of highways.

Again, it frequently happens that several neighboring counties are engaged in diverse pursuits, and are unable to exchange their products advantageously, simply on account of the lack of means of communication. The poverty of one county, or its lack of direct benefit, prevents the construction of a complete highway connecting all the centers which should be brought into business and social contact. One striking example of such a condition of affairs is afforded in the consideration of the necessity for a road through Butte, Plumas, and Sierra counties. Such a highway would materially cheapen the cost of merchandise for the two latter counties, and bring their products to business centers at a much less cost, but Butte cannot afford to construct and maintain expensive roads solely for the benefit of Lassen and Sierra counties, and these latter counties are prevented by law from building beyond their confines.

The construction of ten miles of road in Mono County, connecting the terminus of the Tioga road, which traverses Tuolumne and Mariposa counties, with the now existing county roads of Mono, would bring the people on the east side of the Sierras and the western portions of Nevada into direct contact with the great valley of California. There are, however, very few people living in that portion of Mono County through which the road should be constructed, and the county now maintains as many miles of road as its means will justify. The ten miles of road referred to would be of comparatively little benefit to the county itself, and in view of the lack of funds it cannot be expected that the county would construct the road. The extension of State aid in this direction, however, would bring about the construction of a good road along easy and direct lines, and be of material benefit to the entire State.

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THE PROPOSED STATE HIGHWAYS.

Guided by the principles necessary to be considered and the conditions presented, the Bureau has mapped out a system of State highways, outlined upon the relief map of the State in the office of the Bureau. This map, which shows at a glance the topographical features of the State, was secured in the belief that its use would result in a better understanding of the problems which the Bureau is expected to solve, point out more clearly the errors incidental to our present system, particularly the defect of faulty location of roads, and demonstrate the breadth and scope of the plan recommended. Upon it have been represented all the important roads now in existence and the proposed system of State highways.

The highways mapped out are as follows:

1. A highway, commencing on the line between the State of California and the State of Oregon, at or near the point where said State line is intersected by the road from Yreka, California, to Ashland, Oregon, and extending thence southerly, along the best grades and alignments,

through the counties of Siskiyou, Shasta, Tehama, Butte, Yuba, Sutter, Sacramento, San Joaquin, Stanislaus, Merced, Madera, Fresno, Tulare, Kern, Los Angeles, and San Diego, to Tia Juana, in the last-named county.

2. A highway, commencing at Crescent City, in Del Norte County, and extending thence south and southeasterly, on the best grades and alignments, through the counties of Del Norte, Humboldt, Mendocino, Sonoma, and Marin, to Sausalito.

3. A highway, commencing in the City and County of San Francisco, and extending thence southeasterly, on the best grades and alignments, through the counties of San Mateo, Santa Clara, San Benito, Monterey, San Luis Obispo, Ventura, and Los Angeles, to the City of Los Angeles.

4. A highway, commencing at a point on the State highway through Tehama County, at or near the station of Tehama, and extending thence southerly, on the best grades and alignments, through the counties of Tehama, Glenn, Colusa, Yolo, and Solano, to Vallejo.

5. A highway, commencing at the City of Martinez, and extending thence southeasterly, on the best grades and alignments, through the counties of Contra Costa, Alameda, San Joaquin, Stanislaus, Merced, Fresno, Kings, and Kern, to a point on the State highway through Kern County, at or near Bakersfield.

6. A highway, commencing at a point on the State highway through Shasta County, near the westerly base of Mount Shasta, and extending thence southeasterly, on the best grades and alignments, through the counties of Siskiyou, Shasta, Lassen, Plumas, Sierra, Nevada, El Dorado, Alpine, Mono, Inyo, and Kern, to Indian Wells, in the last-mentioned county.

7. A highway, commencing at Arcata, in Humboldt County, and extending thence southeasterly, on the best grades and alignments, through the counties of Humboldt, Trinity, and Tehama, to a point on the State highway through Tehama County, at or near Red Bluff.

8. A highway, commencing at a point on the State highway through Shasta County, north of Redding, and extending thence northeasterly, on the best grades and alignments, through the counties of Shasta, Plumas, and Modoc, to Fort Bidwell, in the last-mentioned county.

9. A highway, commencing at the City of Marysville, and extending thence northerly and northeasterly, on the best grades and alignments, through the counties of Yuba, Butte, Plumas, and Lassen, to Susanville, in the last-mentioned county.

10. A highway, commencing at the City of Ukiah, and extending thence southeasterly, on the best grades and alignments, through the counties of Mendocino, Lake, and Yolo, to the City of Sacramento; thence easterly, through the counties of Sacramento and El Dorado, to a point on the State line between the State of California and the State of Nevada, at or near its intersection by the Lake Tahoe wagon road.

11. A highway, commencing at or near the City of Santa Rosa, and extending thence southeasterly, on the best grades and alignments, through the counties of Sonoma, Napa, and Solano, to Suisun, in the last-named county.

12. A highway, commencing at a point on the State highway running north from Sacramento, and extending thence northeasterly, on the best grades and alignments, through the counties of Sacramento, Placer, Nevada, and Sierra, to a point on the State highway through Sierra County, near Susanville, in the last-mentioned county.

13. A highway, commencing at the City of Oakland, and extending thence easterly, on the best grades and alignments, through the counties of Alameda and San Joaquin, to a point on the State highway through San Joaquin County south of the City of Stockton.

14. A highway, commencing at the City of Oakland, and running thence northerly and easterly, on the best grades and alignments, through the counties of Alameda and Contra Costa, to Martinez.

15. A highway, commencing at Ione, in Amador County, and extending thence easterly, on the best grades and alignments, through Amador County, to Jackson; thence southeasterly, through the counties of Amador, Calaveras, and Tuolumne, to Sonora.

16. A highway, commencing at a point on the State highway through Santa Clara County, at or near Gilroy, and extending thence northeasterly, on the best grades and alignments, through the counties of Santa Clara, San Benito, Merced, and Mariposa, to the easterly line of the State grant, Yosemite Valley.

17. A highway, commencing at a point on the State highway through Santa Clara County, at or near Gilroy, and extending thence southeasterly and easterly, on the best grades and alignments, through the counties of Santa Clara, San Benito, Merced, and Fresno, to the City of Fresno.

18. A highway, commencing at Modesto, and extending thence northeasterly, on the best grades and alignments, through the counties of Stanislaus and Tuolumne, to Sonora.

19. A highway, commencing at or near Hollister, and extending thence southeasterly, on the best grades and alignments, through the counties of San Benito and Fresno, to a point on the westerly highway through the last-mentioned county, near Huron.

20. A highway, commencing at a point on the State highway through San Luis Obispo County, at or near San Miguel, and extending thence easterly, on the best grades and alignments, through the counties of San Luis Obispo and Kern, to a point on the westerly State highway in the last-mentioned county.

21. A highway, commencing at Port Harford, in San Luis Obispo County, and extending thence southeasterly and northeasterly, on the

best grades and alignments, through the counties of San Luis Obispo, Santa Barbara, Ventura, and Kern, to Indian Wells, in the last-named county.

22. A highway, commencing at the City of Los Angeles, and extending thence easterly, on the best grades and alignments, through the counties of Los Angeles and San Bernardino, to the City of San Bernardino; thence southwesterly, on the best grades and alignments, through the counties of San Bernardino, Riverside, and Orange, to Santa Ana, in Orange County.

23. A highway, commencing at a point on the State highway through Shasta County, north of Redding, and extending thence northwesterly, on the best grades and alignments, through the counties of Shasta and Trinity, to Weaverville, in the last-named county.

24. A highway, commencing at Nevada City, and extending thence westerly through the counties of Placer, Yuba, Sutter, and Colusa, on the best grades and alignments, via the cities of Marysville and Colusa, to a point on the State highway through said last-named county.

25. A highway, commencing at Markleeville, and extending thence easterly, on the best grades and alignments, to a point on the State highway through Alpine County.

26. A highway, commencing at Mariposa, and extending thence northwesterly, on the best grades and alignments, to a point on the State highway through Mariposa County.

27. A highway, commencing at Visalia, and extending thence westerly, on the best grades and alignments, through the counties of Tulare and Kings, to Hanford, in Kings County.

28. A highway, commencing at a point on the State highway through Alameda County, at or near Niles, and extending thence southerly, on the best grades and alignments, through Alameda and Santa Clara counties, to San José; thence southwesterly, on the best grades and alignments, through the counties of Santa Clara and Santa Cruz, via the cities of Los Gatos and Santa Cruz, to a point on the State highway through Santa Cruz County, near Watsonville.

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THE PRINCIPLES OF STATE HIGHWAY LOCATION.

It will be observed by consulting any good map of the State, or the relief map of the State in the office of the Bureau, that the system of highways herein presented follows four fundamental principles: First—They are laid out along those lines which the physical features of the State forever fix as the easiest lines of communication;

Second—The great belts of natural wealth which our State possesses are each traversed by one or more highways;

Third—The system connects all the large centers of population within the limits of the State;

Fourth—The system reaches the county seat of every county, and taps the lines of county roads so as to utilize them to their fullest extent.

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CONSTRUCTION AND MAINTENANCE OF STATE HIGHWAYS.

The subject of the cost of these highways naturally suggests itself at this point. A careful consideration of the matter will serve to convince any reasonable person that while the expenditure may seem large, it is really an economical investment, in the sense that one large outlay for a good purpose, and with good results, is more economical than the constant outlay of smaller sums, resulting ultimately in an enormous total and producing no results. Of the approximately 4,500 miles of State highways herein recommended, about one fifth would be constructed in the valleys of California, where the soil conditions are favorable, and only grading, rolling, and draining, including the construction of culverts, would be necessary, involving an average outlay of about $500 per mile. Another fifth would be through adobe, alkali, or clay, or other unsuitable soil of the valleys, where it would be necessary to make an artificial surface of hardpan, coarse sand, or other available material, mixed with clayey soil, which would call for an average outlay of $2,000 per mile; fifteen per cent of the mileage would consist of mountainous road, where grading and draining would be necessary, but only portions of which would require macadamizing, and a fair estimate of the cost of such a road would be $3,250 per mile; the remaining forty-five per cent of the mileage would consist of roads through mountainous and rolling land, and would require heavy grading, and the cost of such roads would average $4,500 per mile. These estimates are exclusive of bridges over fifteen feet in length; but it should be remembered that in many instances where bridges are now constructed an expert road-builder would fill in with dirt or utilize vitrified pipe, as the Bureau has been constantly urging upon the various Boards of Supervisors. In that portion of the mileage in which it is not at present deemed necessary to incur the expense of metaling, a more resistant surface may be required in the future. When this time shall come, the roadway will be found to be ready to receive the necessary improvements, having been placed in this condition under the system herein recommended, and it will not be necessary to relocate, regrade, and build permanent substructures.

Were it not for the fear of neglect, the maintenance of these State highways should be left to the counties, but experience would seem to dictate the folly of such a step. The question of maintenance is of immense importance, and if California is to take a forward step in highway matters every detail must be considered. Road-sprinkling can be practiced for about $50 per mile, not including the cost of securing the water, and such other maintenance as might be necessary could be met by an expenditure of $40 per mile. The cost of maintaining roads not requiring sprinkling would not exceed $75 per mile.

To those who are prone to urge against every innovation the expenditures involved, the most convincing answer is afforded in the experience of this State. For nearly half a century, millions and millions of dollars have been expended on our highways, as has been previously demonstrated, and the results have been practically *nil*. The almost total lack of mileage of properly constructed highways, notwithstanding such gigantic expenditure, answers any possible objection to the introduction of the system proposed on the score of finance, and no other objection seems even remotely possible. The proposition is by no means of small proportion; and the outlay must be proportionate. But with it all, there will result in the end an absolute saving to the people of the State. System will always produce better results with less expenditure of money than haphazard methods. It is not intended that the culmination of this plan shall be witnessed in a month or a year from the date of its inauguration. Had it been introduced half a century ago, when California was first organized, we should have had greater prosperity with less taxation. If it be introduced now it will take less than this time to complete the system for us.

To carry out this plan, a State body clothed with the necessary power to construct and maintain these highways must be created. It should be comprised of men of unquestioned integrity, selected because of their ability as road-builders. Their powers should be clearly defined, and their work vigorously prosecuted.

The money raised should be expended solely on the construction and maintenance of these highways. Such legal requirements and expenses as may be deemed necessary in securing the rights of way should be met by the counties. No favoritism should be shown any particular section in the construction of State highways. Some work, however little, should be performed at widely separated localities, thus affording the people throughout the State relief from one of their greatest burdens, and, incidentally, an object-lesson in the proper construction of good roads.

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COUNTY THOROUGHFARES.

The county thoroughfares, or highways of the second class, as they might be called, should be the most important roads of each county. They should be so declared and set apart by the Board of Supervisors of each county, and the advice of the County Surveyor and the Bureau of Highways, or such other body as may be entrusted with the construction of the State highways, should be secured. These roads should serve the general interests of the county; they should be constructed under the direction of the local authorities and with the same care as the State highways, to which they would serve as feeders. It is but reasonable to presume that with the example of roads scientifically constructed by the State, the county road-builders would exert themselves to attain the same degree of excellence in their local work.

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DISTRICT ROADS. The district roads, or highways of the third class, should include all existing roads not included under State highways and county thoroughfares, and all such additional roads as may be constructed to serve the immediate necessities of any particular neighborhood. The people desiring such a road should be authorized by law to organize themselves into a district after the manner of the organization of school districts, and cause to be constructed such roads as they desire. These roads, in turn, would serve as feeders to the county thoroughfares generally, and in some particular cases to the State highways.

With the adoption and vigorous administration of the plan recommended, the road problem in California will have been solved.

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WIDTH OF TIRES. There are, however, numerous matters which, perhaps of lesser innovation, are none the less essential to the complete success of the road system of California. Of these the most important is the adoption of some general regulation as to the width of wagon tires.

Wherever improved roads have been constructed, an important element in their maintenance and repair has been found in proportioning the width of tire to the load carried. This has been found essential in Inyo County, where tires for wagons range from 3 to 12 inches in width. The introduction of them about twenty years ago was greeted with ridicule, but after practical use they have been adopted, and no narrow-tired wagons were found on sale, although an abundance of wide-tired farm wagons was noted.

In Sacramento and Santa Cruz counties the use of wide-tired sprinklers has been found beneficial. Throughout the State those who have used wide tires have found that they admit of hauling heavier loads. The heavy harvesting machinery of California would be useless without wide tires.

In France, Belgium, Switzerland, Austria, Germany, and Canada, heavy loads are not allowed on the roads at all unless the tires are of widths prescribed by law. There are also corresponding provisions in the laws of New York, Michigan, Ohio, Kentucky, Indiana, Massachusetts, Vermont, and Pennsylvania.

There is a prejudice against wide tires among many farmers and teamsters who have never used them, but this prejudice will gradually disappear with a broader knowledge of the subject.

The Bureau recommends that a law be enacted which prescribes 3 inches as the minimum width of tire for ordinary farm and road wagons, and for wagons intended for loads between four and six tons that the minimum width of tire be fixed at 4 inches; for loads more than six and less than eight tons, that the minimum width of wagon tires be fixed at 5 inches, and for wagons designed for carrying more than eight tons that the minimum width of tire be fixed at 6 inches. It will be necessary to bring this law into force gradually, as an arbitrary enforcement at an early date would work expense and hardship upon both manufacturers and users. It is therefore advised that after January 1, 1899, a fine be prescribed for having wagons on sale which do not conform to the law as to width of tire, and that after January 1, 1900, the use of wagons not conformable to the law be subject to a license.

In the meanwhile, it is thought that a better comprehension of the fact that wide-tired wagons are road-builders, and that narrow-tired wagons are road-destroyers, will tend to the general introduction of wide tires.

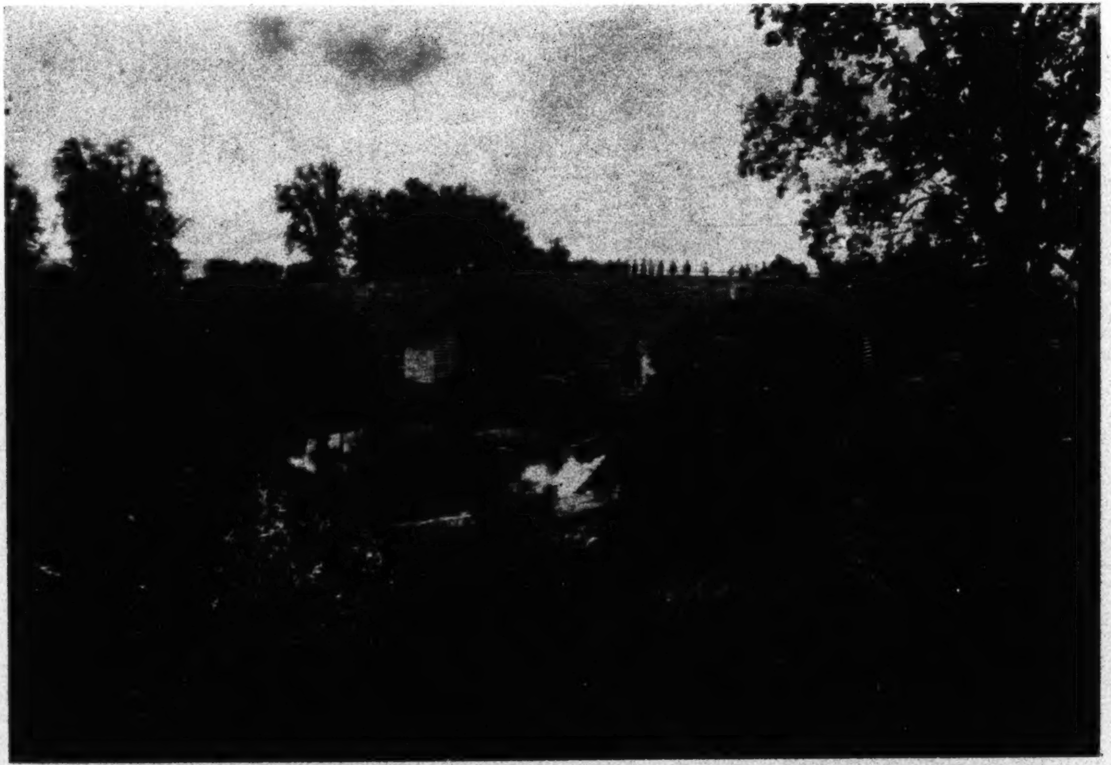
* * * * *

ROAD STRUCTURES.

The vast amounts of money expended on the road structures of our State necessitate the consideration of methods of economy in their construction and maintenance. Upon a system of roads covering so large an area as the State of California, the road structures are important and necessarily costly. These structures range from large bridges spanning navigable waters to small box drains conducting a few inches of water under or alongside of the road. These structures in the past have largely been built of the most perishable materials, and repairs and renewals have been a severe tax upon the industries of the State. The adoption of the most durable materials available for these structures is therefore urged. Bridges and culverts, where possible, should be built of stone, concrete, or brick. Small culverts and drains should be built of concrete and salt-glazed sewer-pipe. Where the bridges are of such length and character as to require wooden floors, the floors should be protected from wear by a good pavement of asphaltum or bituminous rock. All wooden bridges should be roofed over, and wooden chords covered with galvanized iron thoroughly painted. Iron and steel parts should be hammered clean of rust and kept well painted. Several counties have realized the economy of permanent road structures, notably Napa, Santa Clara, Alameda, Tuolumne, and

13. Type of Expensive Wooden Bridge.—Should be replaced by masonry bridge.

Photograph by Bureau of Highways.]



14. Type of Economical Stone Bridge.—Across Putah Creek, near Monticello. Cost $19,980. Replaced a wooden structure which, in the aggregate, had cost the county $53,000. For details see Napa County description.

Photograph by H. H. Blakesly, St. Helena.]

several others, mention of which is made under the description of counties.

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DUTIES OF COUNTY SURVEYOR.

The important part which the Surveyor of each county plays in the construction of the county highways renders it necessary that a number of changes be made in the law prescribing and defining his duties. He should be selected by the people on the basis of his ability in, and knowledge of, highway affairs, and should be made the highway adviser of the Supervisors in all matters pertaining to the construction of county highways, just as the District Attorney is their legal adviser. As the law reads at present, his compensation is not definite, but is purely in the nature of fees. As a consequence, it frequently happens that because his political faith differs from that of the majority of the Board of Supervisors, or because the Supervisors wish to control their expenditures directly, the County Surveyor is utterly ignored, his advice and services are never sought, and his position becomes purely an honorary one. He is compelled to depend on his private practice; therefore, it sometimes happens that when his services are desired he is out of the county on professional work. In several counties where the Supervisors have shown a disposition to utilize the services of the Surveyor, the results have been eminently satisfactory. The present law should, therefore, be amended by placing the Surveyor under a definite salary, and so regulating his duties that he should be in attendance upon the Supervisors whenever county highway construction is under discussion or consideration. He should be required to present plans, specifications, and estimates for all important road work, to supervise the construction of the same, and, unless he can certify over his signature and seal that the work has been done in accordance with the plans and specifications, no payments should be made thereon.

* * * * *

FAULTY LOCATION OF ROADS.

One of the most glaring defects in the present highway condition is encountered in the matter of the location of the highways. Rarely is an instance found of the proper consideration of the lines along which the road should be constructed. The radically faulty idea that "roads should lie along land subdivision lines where practicable" has resulted, in almost numberless instances, in locating a road over rolling and hill land, around corners, or through boggy and difficultly drained areas, to the permanent detriment of public rights and convenience. The Bureau has, therefore, constantly insisted upon the introduction of the requirement that *roads must be located upon the best* *grades and alignments which the nature of the country will permit*, and considering that the roads are the lines along which, for all time, must be moved the traffic of a growing civilization, this principle should be imperatively enforced.

* * * * *

TREE-PLANTING ALONG ROADS.

The subject of tree-planting along the highways of our State is a matter of no little importance, and has received but scant attention. Injury has been done to highways in parts of the State by planting evergreen trees closely along the roads where no trees at all should have been planted; and again, evergreens have been planted, to the injury of the road during the rainy season, when deciduous trees would have been of advantage. Again, there are no trees at all where one or the other of the two general classes of shade trees would have been of great advantage. The people should bear in mind that evergreen trees can be used only where the rainfall is slight and where even during the winter season the roads are dry most of the time. This is true for the upper part of the San Joaquin Valley, in the drier portions of Salinas Valley, and in parts of Southern California. In other portions of the State deciduous trees of the kinds suitable to the particular conditions of the locality should be planted. In the coast counties, and particularly along roads exposed to moist summer winds, shade trees should not be planted within fifty feet of highways. The planting of trees should be encouraged and aided by local authorities.

* * * * *

RAIL FRANCHISES.

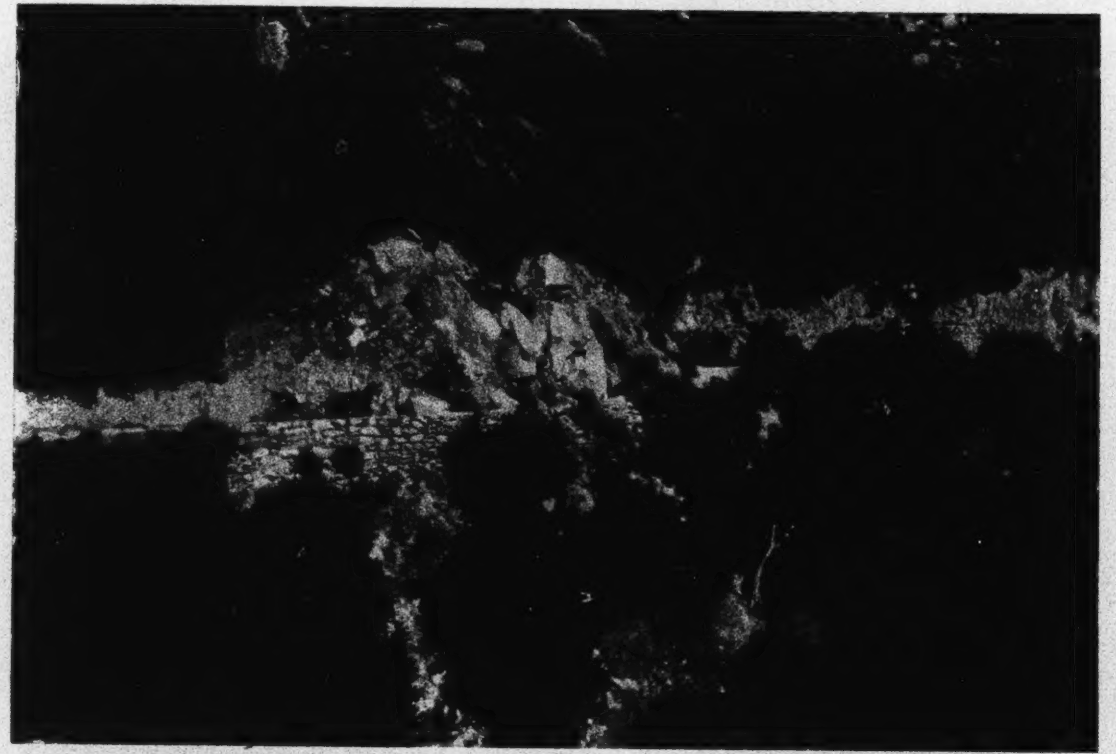
The members of the Bureau have so frequently been brought into contact with the subject of laying rails on highways that they feel it a duty to express the results of their consideration of this matter. There are unquestionably instances in which the public interests demand that a franchise be granted for laying rails on highways. Again, there are instances in which the franchise is asked and granted where public interests would probably best be served by a refusal. In this latter case, the franchise is frequently obtained more to control a highway or to protect existing franchises from competition than to serve public interests. In either case, the rights of the public are ruthlessly overridden by the construction of a rail line in such a manner as to inconvenience or endanger the use of any other vehicle than those designed for rail traffic. The guarding of this interference with common traffic should be very thorough. The individual or corporation to whom a franchise is granted should be compelled to put the rails in that position which should least interfere with traffic, and should further be required

1. Type of Road Crossing a Lava Plain.—Five consecutive roads have been built across this lava plain in Tehama County. Four of these are seen in the foreground. A well-constructed macadam road was being built at the time of the visit of the Commissioners, and cost less than the five worn-out roads. A portion of the macadam road is seen on the extreme right.

Photograph by Bureau of Highways.]

8. TYPE OF WELL-LOCATED WELL-CONSTRUCTED ROAD IN ROLLING COUNTRY.—Maximum grade, seven per cent.

Photograph by Bureau of Highways.]



7. TYPE OF WELL-LOCATED, WELL-CONSTRUCTED MOUNTAIN ROADWAY—Showing dry-masonry retaining wall.

Photograph by Bureau of Highways.)

to use the form of rails and ties which would permit the wheels of other vehicles to pass freely along or over them. Violations of these fundamental requirements should result in a forfeiture of the franchise, and the Bureau recommends the passage of the laws necessary to guard the public rights in these important particulars.[*]

* * * * *

RESUME OF REPORT.

Such is, in as concise a form as is possible, the report of the Bureau of Highways. Brevity has been aimed at (for volumes have been and might be written on this subject), in the hope that the matter therein contained will receive the careful consideration of the great number of people who have manifested their interest in the work of the Bureau, as well as of taxpayers and citizens generally and of the press throughout the State. If a better plan can be offered, the Bureau will gladly aid any movement for its adoption, but at this writing the system herein recommended seems to meet the requirements completely and with the least possible friction and revolution.

The "Good Roads" movement has made rapid strides in California, and has now reached what may be termed the critical point. It must either continue to the logical outcome of this agitation, which will cause California to rank among the foremost States in the Union and among the most progressive localities of the world in highway matters, or it must almost completely retrograde, to be revived, perhaps, in several decades from now by succeeding enthusiasts who will recognize the necessity for good roads. The plan presented has not been hastily evolved; it has been carefully considered, discussed, and digested, and in the opinion of the Bureau represents the best solution of the problem which confronts California.

That the substitution of a definite system for the present irrational, illogical, and slipshod methods is necessary cannot be denied. The observations of the Bureau, the studies made of the conditions peculiar to California, the investigations into the methods in vogue in other States and other countries, the suggestions received from others who have given careful attention to the question in California—all point to the necessity for the adoption of such a plan as that outlined by the Bureau.

The classification of the roads of the State into, first, State Highways, maintained and constructed by the State under the direction of a trained body of expert road-builders, serving the needs of each characteristic industry of the State and advancing the interests of the entire State; second, County Thoroughfares, constructed and maintained by the county under the direction of the Supervisors and County Surveyor, who should be a trained road-builder; third, District Roads, constructed and maintained by the people of particular localities to meet the needs of their district, will result in a system, broad and definite, meeting all present requirements, and still sufficiently elastic to meet all future requirements. This, together with the inauguration of the minor recommendations, such as the adoption of a wide-tire ordinance, construction of permanent bridges and culverts, rational methods of tree-planting, business-like system of keeping accounts of moneys expended on roads and preserving records, economical administration of highway funds, the enlargement of the scope of the work of the County Surveyor, and the vigorous enforcement of the highway laws now in force, would tend to make this Golden State the ideal highway community of the world.

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[*] "Both in cities and on county roads the surface railways, whether actuated by horsepower or electricity, devastate the highway, using an easement for a right of way on the roads and streets with a haughty disregard of the rights of others that should not be allowed if they were held in fee. In spite of the low freight rates on railroads and watercourses, this country has been injured, and to some extent impoverished, through the high cost of transportation on country roads, consequent upon their generally wretched condition."—E. P. NORTH, M. Am. Soc. C. E., in *American Society of Civil Engineers Proceedings*, Vol. XXII, No. 9, November, 1896.

APPENDIX A.

In perusing the reports here made on each county, it will be found that substantially the same facts are repeated for different counties. This is due to the fact that it was determined to consider the affairs of each county individually, and frequently the same conditions and suggestions apply to a number of counties in the same belt.

ALAMEDA COUNTY.

Organized: 1853.

Area: 840 square miles.

Visited: July 17, 1895, by Commissioners Manson and Irvine; September 22, 1896, by Commissioners Manson and Maude.

Mileage: 453.

Improved: A few miles macadamized within past two years; 201 miles graveled; 60 miles sprinkled.

Title and Records: No deeds to rights of way are secured, and there are consequently no records to the county's rights to same. Whenever new roads are accepted, they are surveyed and recorded; all but a few laid out in 1852 are recorded. A road register, consisting of a transcript of the minutes of the Board of Supervisors, is kept. In laying out new roads, maps and notes are filed with the County Clerk and Surveyor.

Manner of Construction and Maintenance: By day's labor.

Accounts: Impossible to ascertain exact amount of expenditures on particular work.

Raising Money: By direct taxation on outside property and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$101,845 74
1894	35	99,239 60
1893	35	100,416 48
1892	30	87,016 60
1891	30	83,674 87
1890	30	78,430 55
1889	30	75,887 62
1888	30	75,512 76
1887	30	61,626 14
1886	25	60,201 52
Total		$813,851 78

Alameda County fronts the Bay of San Francisco on its western shore for a distance of 36 miles. It is divided into two characteristic districts: first, the westerly bay slope, comprising rolling, level, and salt-marsh land, subject to the climatic influences of the bay; and second, the mountain, rolling, and valley lands lying within the Coast Range, and subject to greater variations of temperature and moisture.

The elevations range from tide level to about 4,000 feet; the gently sloping plain at the west base of the Coast Range varies in width from 2 to 10 miles, and is watered by numerous streams, which flow for some seven or eight months each year. Water for road-sprinkling can be obtained only in moderate amounts, and at considerable expense.

The county is important geographically, as through it must pass at least two important highways. The lowest pass through the Coast Range, except the tide-level gap at Carquinez Straits, fixes the location of a road through Livermore Valley and Pass. The concentration of population and wealth in and about Oakland determines the necessity for a north and south highway.

The present road system is extensive, but for many years past has not met the requirements of the growth of industrial wealth. Improvements in the mode of construction of roads and road structures were noted in the second visit of the Bureau, notably in the building of permanent concrete bridges and culverts.

The mountains and hills of the county are principally sandstone and shale, unfit for road-metal. Gravel and cobblestones of excellent quality abound in many of the creeks, and, if screened and the coarser portion crushed, would make good road-metal. Excellent volcanic and metamorphic rocks outcrop at numerous localities; those back of Oakland and Fruitvale are utilized.

ALPINE COUNTY.

Organized: 1864.

Area: 575 square miles.

Visited: August 16, 1895, by Commissioners Manson and Irvine; August 6, 1896, by Commissioner Manson.

Mileage: 54.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; 54 miles graded; toll roads, 36 miles.

Title and Records: Title generally rests upon occupancy. When new roads are opened the prescribed methods are followed. All roads now recognized and worked as county roads have been such for many years. In 1893 the Board of Supervisors declared the above 54 miles county roads, and, by order, abandoned 36 miles previously considered county roads. One road abandoned in 1893 was improved in 1896 without proceeding to re-acquire title, or to annul order of 1893.

Manner of Construction and Maintenance: By day's labor. Road locations have been changed by the Road Commissioner when, in his judgment, the road could more easily be maintained.

Accounts: By entry of warrant and filing voucher; warrant drawn in favor of party doing work, but no mode of ascertaining the cost of any particular road.

Raising Money: Property and poll tax, and license tax on sheep.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	45	$1,144 57
1894	35	1,018 90
1893	20	791 68
1892	20	672 18
1891	20	924 94
1890	20	818 17
1889	8.8	423 46
1888	8	396 75
1887	8.2	410 21
1886	----------	----------
Total	----------	$6,600 86

Alpine County lies upon and between the crest and spurs of the Sierras, in the eastern and central portion of the State. The mean elevation is greater than that of any other county, being about 7,500 feet, with extremes of 11,300 to 5,000 feet.

Under present conditions, the settled portions of the county are tributary to Nevada, but with well-constructed roads can be brought more closely in touch with California.

The features of the county are rugged in the extreme, but many fertile valleys lie along the drainage lines. The county is abundantly watered. Snow falls to great depths over its entire area during winter, and remains during the summer upon the more elevated peaks. Summer rains are not uncommon, and are at times severe enough to wash heavy bowlder deposits across roads. This is particularly noticeable over areas which have been denuded of timber and vegetation.

The rocks are principally granitic and volcanic; the latter are abundant and hard, making good road material.

The county is the least in wealth, population, and mileage of roads.

Water-supply for road-sprinkling could be developed from springs and streams where necessity therefor arises.

AMADOR COUNTY.

Organized: 1854.

Area: 568 square miles.

Visited: August 21, 1895, by Commissioners Manson and Irvine; June 13, 1896, by Commissioner Manson.

Mileage: About 400.

Improved: No miles macadamized; 8 miles graveled; cannot ascertain either miles sprinkled, or miles graded.

Title and Records: The title rests upon old location and possession. Rights recently acquired follow the mode prescribed by law. The proportion of rights of way which are legally vested and recorded is not known, nor can it be ascertained without systematic resurvey of existing roads, as many have been shifted from the old locations, to which old location title has been forfeited by abandonment.

Manner of Construction and Maintenance: By day's labor.

Accounts: Filing vouchers and warrants drawn in favor of party doing work. No mode of ascertaining exact locality and extent of work done.

Raising Money: Property and road poll tax.

(*Note:* Data for Amador County is very meager, as neither the County Clerk nor County Surveyor made satisfactory replies to questions submitted.)

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30¼	$16,070 05
1894	50	20,168 50
1893	40	18,899 51
1892	35	16,179 65
1891	30	17,530 90
1890	36	18,801 18
1889	26	15,563 11
1888	22	12,003 22
1887	29	12,815 16
1886	31.5	12,795 25
Total		$160,826 53

(These figures include both road and bridge taxes.)

Amador lies upon the west slope of the Sierras, between the south fork of the Cosumnes and the north fork of the Mokelumne River. These streams drain the greater portion of the county, a small part of the lower portion being drained by foothill creeks between the larger streams. The entire area is rolling and mountainous, with the exception of a few small valleys, and rises from the base of the foothills, at an elevation of 500 feet, to the crest of the Sierras, 9,500 feet above tide.

Throughout the county good road-metal can be obtained. The rocks are diversified, and embrace the entire range between the granites and lavas of the summit and the slates and gravels of the foothills.

The greater portion of the county is of slate formation, which makes an uneven surface for roads, but, when covered with macadam or gravel, makes a good foundation.

The average rainfall varies from 15 inches in the foothills to 60 inches at the summit. Snow rests upon the upper peaks until late in summer.

The roads are nearly impassable in winter, as they are badly located and drained, steeper than necessary, and made of earth, repaired with brush and dirt. The relocation on practical grades, and proper drainage and surfacing of the roads, are the only remedies which can accomplish real good.

BUTTE COUNTY.

Organized: 1850.

Area: 1,764 square miles.

Visited: November 1, 1895, by Commissioners Manson and Irvine; August 30, 1896, by Commissioner Irvine.

Mileage: 1,200.

Improved: No miles macadamized; 100 miles graveled; 20 miles sprinkled; 600 miles graded.

Title and Records: Title to at least 75% of the mileage is defective; the remaining titles may be classed as good. Title secured by purchase, condemnation, and grant, and by declaration of Board of Supervisors. Records are in poor condition; no reliable information could be obtained.

Manner of Construction and Maintenance: By day's labor, under personal supervision of Road Commissioners and their deputies.

Accounts: Are kept against eighteen road districts.

Raising Money: By direct tax on all outside property and by road poll tax. Transfers also made from general road fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	34	$61,019 75
1894	29	53,158 13
1893	25	62,580 00
1892	25	54,949 29
1891	25	54,975 68
1890	20	57,268 39
1889	25	65,250 41
1888	27.2	61,148 93
1887	35.2	62,381 84
1886	32.2	57,968 76
Total		$581,285 18

Butte County is naturally divided into two districts. Two fifths lie in the valley of California and the remainder extends easterly toward the crest of the Sierras. The valley portion has a general elevation of about 50 feet, rising toward the foothills. The mountain portion rises to elevations of from 7,000 to 8,000 feet, and is intersected by the Feather River and its tributaries, and by Butte, Chico, and several smaller creeks. Much of the valley portion is fertile loam, while to the west lie adobe and swamp lands, subject to inundation in winter.

Abundance of water exists for road-sprinkling, as sub-surface water is reached by shallow wells.

Road materials are abundant in the lavas and metamorphic rocks of the mountain portion, and in the adjacent gravelly loams; through the tule and adobe lands road materials are scarce, except where hardpan can be reached, which, when properly utilized, makes an excellent road surface.

This county maintains quite an extensive system of mountain roads running easterly into Lassen, Plumas, and Modoc, the cost of maintenance of which could be greatly decreased by relocating them upon proper grades, so that heavier loads could be hauled, and the industries more extensively developed.

The Commissioners are pleased to note the permanent improvements that have been carried out since their first visit. On one of the main roads, cuts and fills have been made, reducing the grade materially; a large stone culvert has been built, and the cross-section of the roadbed has been properly constructed. While there are only about 20 miles of roads and streets sprinkled, the results are so gratifying that a determined effort will be made to erect a permanent water system for watering one of the main highways next season.

The average rainfall is 25 inches, usually precipitated during the seven months beginning in October and ending in April.

CALAVERAS COUNTY.

Organized: 1850.

Area: 880 square miles.

Visited: August 22, 1895, by Commissioners Manson and Irvine; June 16, 1896, by Commissioner Manson.

Mileage: 470.

Improved: All more or less; no miles macadamized; no miles graveled; no miles sprinkled; 300 miles graded.

Title and Records: For the past ten years title has generally been obtained in the manner prescribed by law, but the records are not perfect. Early rights of way rest upon usage. The prescribed legal mode is followed in opening roads. Alterations are made by petitioners, who generally give deeds to right of way and open the road. The road book contains general record of new roads, but no surveys or plats of old roads are recorded. Maps filed, but not duly recorded.

Manner of Construction and Maintenance: By day's labor. Contract system of maintenance advertised for, but bids rejected as too costly.

Accounts: Are badly kept. Warrants are sometimes drawn for road work by and in the name of the Road Commissioner, and sometimes in favor of the party doing the work. No mode of ascertaining the exact location and extent of work done.

Raising Money: By property and poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	23	$14,065 55
1894	24	15,403 49
1893	22	13,088 86
1892	25	11,217 40
1891	21	9,815 93
1890	18	8,670 59
1889	15	7,722 31
1888	15	7,867 20
1887	16	8,065 94
1886	30	13,108 25
Total		$106,943 24

This county extends from the foothills to the crest of the Sierras, rising from the floor of the valley to about 9,500 feet, and lying between the Mokelumne and Stanislaus rivers, whose tributaries drain nearly the entire county.

There is an abundance of road-building material in the volcanic and metamorphic rocks; but the important roads lie along the slate belt, and are difficult and costly to operate and maintain by reason of faulty location and drainage and the attempt to maintain the road surface on the slate, which varies in hardness.

Water could be secured for the main roads from streams, springs, and ditches; but the energies of the county should be devoted to the economic reconstruction of roads on proper lines.

The total expenditure upon the roads in this county since its organization is estimated at $450,000.

COLUSA COUNTY.

Organized: 1850.

Area: 1,060 square miles.

Visited: November 11, 1895, by Commissioner Irvine; June 29, 1896, by Commissioner Irvine.

Mileage: 565.

Improved: No miles macadamized; 280 miles graveled; no miles sprinkled; 420 miles graded.

Title and Records: To about one fourth of all the roads the title is perfect, but when roads are condemned, no deeds are taken. The balance of the roads are used by sufferance. Title acquired by purchase, condemnation, and grant. Records are in good condition, and particular attention is paid to the mapping and filing of same.

Manner of Construction and Maintenance: Construction mostly by contract, under supervision of County Surveyor, and has proved very economical. Maintenance by day's labor.

Accounts: Only five districts, each being kept separately.

Raising Money: By direct tax on all outside property and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	28	$29,108 62
1894	25	32,247 31
1893	26	33,747 52
1892	30	38,321 61
1891	40	49,602 20
1890	40	94,458 01
1889	30	68,964 46
1888	30	69,890 32
1887	30	66,120 00
1886	35	76,854 00
Total		$565,313 67

Colusa County extends from the crest of the westerly spur of the Coast Range westward to the Sacramento River and Butte Creek, one third of the area being mountainous and rolling. It has a frontage of

50 miles on the navigable portion of the Sacramento River. Water can be obtained from surface wells through the valley portion, and from streams and springs in the foothills, for important roads. There is gravel in all but the fourth road district. The roads are easily maintained in the valley if well located and drained, but are difficult and costly over areas subject to inundation.

(The Bureau is indebted to Mr. J. R. Price, C.E., recently County Surveyor of Colusa, for accurate data as to mileage of roads given above.)

CONTRA COSTA COUNTY.

Organized: 1850.

Area: 750 square miles.

Visited: July 19, 1895, by Commissioners Manson and Irvine; September 24, 1896, by Commissioners Manson and Maude.

Mileage: 450.

Improved: No miles macadamized; 126 miles graveled; 7½ miles sprinkled; 425 miles graded by the county and by private subscription.

Title and Records: No records, and but few deeds, available. No form of road book is kept. Some old records are supposed to exist, but they are stored away unindexed. Title is obtained according to Code now. In the past, roads were declared public highways simply by ordinance. Maps accompanying reports of viewers are recorded.

Manner of Construction and Maintenance: Generally, by day's labor. Some mountain roads have been built by contract.

Accounts: Not segregated and itemized so that the cost of any particular road can be ascertained.

Raising Money: By direct taxation on outside property, by road poll tax, and by transfer of funds from general to road fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$55,228 93
1894	30	45,787 24
1893	32	52,546 83
1892	32	50,721 06
1891	33	61,447 14
1890	34	53,420 56
1889	24	37,768 37
1888	27	44,100 62
1887	29	45,893 98
1886	30	43,700 44
Total		$490,615 17

Contra Costa County lies just south and east of the bays of San Pablo and Suisun and east of the summit of the Coast Range. Three quarters of the county is mountain and rolling land, and the remainder is valley and swamp.

The principal features are the Alhambra Valley, lying between the spurs of the Coast Range, and the isolated peak, Mount Diablo, rising some 3,850 feet above tide level.

The rock of the county is principally sandstone and shale unfit for road-metal, but at the following localities road-metal exists: Gravel in Marsh, Concord, and other creeks; limestone, near Clayton; basalt, east of Concord and 2 miles east of Brentwood; jasper and porphyry in Mitchell Cañon, and decomposed quartz near San Pablo. At many other localities quarries may be developed.

Water is obtainable in most of the valley, and supplies will have to be developed with much care and skill.

The value of bridges and culverts is about $68,000.

DEL NORTE COUNTY.

Organized: 1857.

Area: 1,546 square miles.

Visited: February 1, 1896, by Commissioner Manson; August 14, 1896, by Commissioner Irvine.

Mileage: 102.

Improved: No miles macadamized; 100 miles graveled; no miles sprinkled; 40 miles graded; redwood puncheon, 12 miles.

Title and Records: Title is complete for the greater portion, being acquired by purchase, condemnation, and grant. Records are in very good condition; most of the roads recorded and filed with the Clerk of the Board.

Manner of Construction and Maintenance: Entirely by day's labor.

Accounts: The county is divided into road districts, and the accounts kept by said districts.

Raising Money: By direct taxation and road poll tax. Special levies have also been made in road districts.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$5,008 40
1894	40	12,211 04
1893	40	14,877 28
1892	40	10,011 38
1891	40	12,606 97
1890	40	9,222 47
1889	40	7,896 81
1888	40	7,770 73
1887	37	5,516 24
1886	38	6,069 12
Total		$91,188 53

Del Norte is one of the northernmost counties in the State, with a coast-line of 35 miles. It is rolling and very mountainous, only a small percentage being suitable for agricultural products. Immense redwood forests abound throughout the county.

Road-building material is very scarce. Gravel is found only in a few streams, and is difficult to obtain. Trap and basalt are found in small quantities in some portions.

Redwood puncheons for road purposes are used quite extensively, and very successfully. The puncheon type of road serves a useful purpose in timbered countries, and is built of split and hewn slabs some 8 feet long, 6 inches thick, and of variable width, laid, like the corduroy roads, upon a graded and drained roadway.

Water for sprinkling purposes can be had either by gravitation or pumping.

The mileage of roads, exclusive of toll roads, is small, and most of it difficult to maintain.

The mountain grades are well located, but are subject to slides and washouts, owing to the excessive rainfall, which reaches the enormous amount of 100 inches annually in the extreme northwestern corner of the county. The average rainfall is between 60 and 70 inches, rain falling every month in the year.

EL DORADO COUNTY.

Organized: 1850.

Area: 1,891 square miles.

Visited: August 12, 1895, by Commissioners Manson and Irvine; July 30, 1896, by Commissioner Manson.

Mileage: 896.

Improved: All mileage more or less macadamized; no miles graveled; 5 or 6 miles sprinkled; 3½ miles graded.

Title and Records: The title to roads is good. They were surveyed and recorded in 1863. Titles are obtained and deeds given, as prescribed by law. The records of all roads are in fair condition, but, in the absence of a prescribed form, and having been made by various officials, are not uniform.

Manner of Construction and Maintenance: Generally by day's labor. Contract system of working roads was tried, and gave good results.

Accounts: Are well and accurately kept by districts and general road fund, but warrants are drawn by and in the name of the Road Commissioner; it is not possible to ascertain where and to what extent work is done.

Raising Money: By property and poll tax, and transfers from other funds to road fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	33	$14,858 90
1894	33	18,554 29
1893	33	15,919 32
1892	35	19,401 33
1891	40	25,133 25
1890	40	13,710 49
1889	20	13,862 50
1888	20	15,430 41
1887	25	14,248 41
1886	25	12,790 09
Total		$163,406 29

El Dorado County extends from the base to the summit of the Sierras, rising from the floor of the valley of California to elevations of 9,000 to 10,000 feet. It is bounded by the middle and southeast forks of the American and the south fork of the Cosumnes Rivers, whose tributaries drain the county.

The rocks vary in character, extending through the entire range of exposures, from the slates of the foothills to the granites and lavas of the summit. Volcanic and metamorphic rocks and limestone are abundant throughout the county. The county is well watered, and supplies for road-sprinkling can be developed from streams, springs, and ditches.

The county owns only scrapers for road-building, and maintains no guide-posts. Road-sprinkling is done by contract during the months from July to October, inclusive, to the extent of 3½ miles. The district pays $25 per month, and the remainder is subscribed by residents. The water is supplied by gravity flow from mining ditches.

The value of bridges in the county is $73,000.

El Dorado County has taken advanced steps to abandon expensive and difficult grades, and relocate the roads along economical lines. On the road between Placerville and Coloma the old faulty location was abandoned, and the road relocated upon proper lines. The road from Placerville to Grizzly Flat has been similarly improved. Grades ranging from 20% to 25% (3 inches to the foot) have been changed to a 6¼% grade (¾ inch to the foot). From Placerville to Weber Creek corresponding improvements have been made, changing 25% grades to 8½%. These changes have all given satisfaction and benefit, and, consequently, many others are contemplated.

A systematic plan of grades and alignments, upon which all work could be continuously directed, would greatly advance the ultimate interests and wealth of this progressive county.

The public rights were, however, permitted to suffer in the relocation of the road entering Placerville, which relocation was necessitated by the extension of the railroad into the town. The road should follow a widened roadbed instead of over increased grades upon improper location.

FRESNO COUNTY.

Organized: 1856.

Area: 5,940 square miles.

Visited: February 21, 1896, by Commissioners Irvine and Maude; July 11, 1896, by Commissioner Manson.

Mileage: 1,435, of which 1,235 are in the valley, and 200 in the mountains.

Improved: No miles macadamized; no miles graveled; 6½ miles sprinkled; 200 miles graded.

Title and Records: The titles to rights of way are in good shape, and recorded as given below. Road records consist of (1) a bound volume showing number of road, termini, page and number of road register, and, on opposite page, a sketch of road alignment, scale 2 inches to 1 mile; (2) a road register giving the data required by law; (3) an index to abstracts of road deeds; (4) abstract of road deeds, in two volumes.

Manner of Construction and Maintenance: Maintenance, by day's labor; construction, over $200 by contract, with excellent results.

Accounts: Fairly well kept, but do not show exact locality and amount of work done. Payments made by warrants drawn in favor of parties doing work.

Raising Money: By property and poll tax. Road bonds were issued in 1878, 1879, and 1880, for the redemption and interest of which $1,050 is collected annually.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$55,769 78
1894	16	49,927 29
1893	32	88,910 10
1892	25	91,531 06
1891	25	90,612 91
1890	22	70,583 22
1889	16.8	48,381 70
1888	14.6	42,228 34
1887	20	51,085 09
1886	23	34,534 77
Total		$603,514 26

Fresno County extends from the crest of the Coast Range to the crest of the Sierras; one half the area lying in the valley of California, which the county crosses near its widest place. The climatic and physical features, therefore, present the widest range.

Good road material exists in all parts of the county. Through the valley, hardpan, gravel, sand, and clay can be obtained. In the mountain portion, hard volcanic and metamorphic rocks exist at numerous localities.

Water for road-sprinkling can be obtained from wells and ditches, and road-sprinkling has been inaugurated around Fresno. Road-sprinkling is done by a new system, which has not yet proven satisfactory as to method.

The county owns a ten-ton road-roller, scrapers, plows, shovels, picks, etc., but no official list of property is kept.

Improved methods of road location, construction, and maintenance are being introduced.

The value of bridges in the county is about $250,160.

(The Bureau is indebted to the County Surveyor, Mr. George L. Hoxie, C.E., for accurate and extended data.)

GLENN COUNTY.

Organized: 1891.

Area: 1,248 square miles.

Visited: November 9, 1895, by Commissioner Irvine; July 8, 1896, by Commissioner Irvine.

Mileage: 440.

Improved: No miles macadamized; 188 miles graveled; no miles sprinkled; 200 miles graded.

Title and Records: Title to all new roads is perfect, but those used before the county was separated from Colusa County are defective. Title is secured by purchase, condemnation, and grant. Records are in good condition. Road register well written up, and all new roads mapped and recorded.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioners, and, in many instances, by contracts.

Accounts: Are kept under supervisoral districts, as they are not subdivided.

Raising Money: By direct taxation and road poll tax.

Amount Expended in Past Five Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$27,749 14
1894	19.5	21,575 28
1893	19.4	23,078 19
1892	15.6	19,565 81
1891	21	22,964 79
Total		$114,933 19

Glenn County lies on the west side of the Sacramento River, near the head of the valley of California, and extends west to the summit of the Coast Range. The rolling and mountainous land is about equaled by the valley area. The crest of the Coast Range, on its western border, rises to 7,000 feet above tide.

Road-building material of almost every description is found in different portions of the county. Gravel of the best quality abounds in all creek-beds, and the supply is inexhaustible, while deposits of the same quality are scattered throughout the county. In the foothills and mountains trap and basalt are plentiful.

Water for sprinkling may be obtained from wells and also by gravitation.

Though the roads in this county are subject to overflow from the mountain streams, they are in excellent condition, because they are graded on a level with the surrounding country, and offer very little resistance to the receding water. Improvements of a permanent nature are being made all the time.

Since the first visit of the Commissioners the recommendations presented to the Board of Supervisors have been carried into effect. Plenty of vitrified pipe of assorted sizes is on hand, and all wooden culverts are being replaced with the pipe as soon as they need repairing. The Board of Supervisors has also purchased a road-roller, and are enabled, with its use, to do much better and more permanent work.

Bridges have been a source of great expense in this county, and there are several good structures. The value of the bridges and culverts is approximately $125,000.

The maximum rainfall, amounting to over 30 inches, is reached in the mountains, causing the streams to rise rapidly, notably Stony Creek.

Great damage results to bridging and highways. The rainfall in the valley portion of the county averages 12 inches annually.

HUMBOLDT COUNTY.

Organized: 1853.

Area: 3,507 square miles.

Visited: January 29, 1896, by Commissioner Manson; August 18, 1896, by Commissioner Irvine.

Mileage: 1,020 miles roads; 500 miles trails.

Improved: No miles macadamized; 160 miles graveled; 4 miles sprinkled; 700 miles graded; redwood puncheon, about 10 miles.

Title and Records: Title is very incomplete, and not more than 25% of the mileage of roads is deeded and recorded. It is secured by purchase, condemnation, and grant. Records of late years are well preserved, but of the earlier roads of the county many records are missing. Road register in fair condition.

Manner of Construction and Maintenance: By day's labor principally, and in isolated instances by contract.

Accounts: Are kept by supervisoral districts, as they are not subdivided into road districts.

Raising Money: By direct tax on outside property and by road poll tax. Auditor's books also show transfers from county general fund to road fund. $25,000 bonds issued in 1893, 7%, twenty years.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$78,392 63
1894	40	82,044 26
1893	40	107,265 63
1892	40	67,382 02
1891	40	79,047 36
1890	25	80,108 76
1889	25	59,218 01
1888	25	53,480 24
1887	28	60,759 71
1886	30	38,376 35
Total	....	$706,063 97

Humboldt County lies just below Del Norte, on the coast, and joins Mendocino on the south. The surface is in general extremely mountainous, with some large, level valleys interspersed in different portions.

Material for road-building purposes is scattered throughout different parts of the county, and is plentiful. Gravel is found in abundance in all the valleys, while trap, basalt, limestone, and a hard sandstone are abundant. The last named is native rock, while the others are of glacial deposit.

As in Del Norte County, redwood puncheons are used on some roads, and give good results, especially in low or springy ground.

Water for sprinkling can be obtained from springs and mountain streams by gravitation, and is available in the lower valleys by wells and pumping.

The mountains are extremely steep and rugged. The roads are poorly located, and, owing to the enormous rainfall, are subjected to slides and washouts, which make their maintenance expensive. All the larger streams are well bridged, and the total cost of these bridges and culverts has been $137,850.

Much improvement can be noted since the Commissioners' first visit to this county. A system of sprinkling has been inaugurated, and is being increased as rapidly as means will permit. It was an innovation in road work, and had many opponents, but the people are well pleased with the "experiment," as they term it, and are demanding that a large portion of the funds be used for this purpose.

The City of Eureka has purchased a 30,000-lb. steam road-roller and a rock-crusher, and is building some excellent streets. This should serve as an object-lesson for the Board of Supervisors.

The average rainfall is about 40 inches.

INYO COUNTY.

Organized: 1866.

Area: 10,224 square miles.

Visited: February 12, 1896, by Commissioner Manson; August 25, 1896, by Commissioner Manson.

Mileage: 458.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; cannot ascertain number of miles graded.

Title and Records: The title to old roads rests upon usage. New roads are opened in accordance with the methods prescribed by law; alterations and closings in the same manner. Records consist of index and separate record book of all road proceedings, giving the meager data required by law.

Manner of Construction and Maintenance: By day's labor.

Accounts: Claims are presented and warrants drawn by and in the name of the Road Commissioner, with verified claims attached of each individual doing work or furnishing materials; no mode of ascertaining exact locality and extent of work.

Raising Money: By property and poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.			Amount.
	Bridge.	Road.	Total.	
1895	1.5	13	14.5	$4,649 98
1894	4	22	26	5,081 00
1893	5.4	20	25.4	4,825 26
1892	5	20	25	4,275 59
1891	5	20	25	4,241 82
1890	10	20	30	4,749 99
1889	6	12	18	3,080 87
1888	12	12	24	3,784 66
1887	--	--	18	2,580 65
1886	--	--	12	1,707 81
Total				$38,977 63

Inyo County extends from the crest of the high Sierras eastwardly to the State line. The principal features are four nearly parallel ranges of mountains, rising abruptly to elevations of from 10,000 to 15,000 feet. Between these ranges are Owens River, Saline, and Death valleys, having general elevations of 4,000, 1,000, and 300 feet above sea-level, the latter valley containing areas depressed below sea-level by several hundred feet.

The mean annual rainfall is less than 2 inches, so that water, except at the easterly base of the Sierras, is scarce.

The rocks of the county furnish excellent road-building materials in abundance, and much of the soil is of a gravel formation, giving a fair road surface. Many stretches lie through sandy soils, which would be difficult and costly to improve.

The roads crossing Owens River Valley need grading and draining; and in certain alkaline, clayey soils, a coating of sand would greatly improve them. These roads would be greatly improved by sprinkling.

The county owns two $500 road-graders; plows and scrapers are owned by the road districts; but no list of county and district property is kept.

KERN COUNTY.

Organized: 1866.

Area: 8,159 square miles.

Visited: February 12, 1896, by Commissioners Irvine and Maude; July 21, 1896, by Commissioner Manson.

Mileage: 1,023.

Improved: ¼ mile macadamized; 2 miles graveled; 2 miles sprinkled; 341 miles graded.

Title and Records: The title to 65% to 70% of the roads is good; to the remainder it rests upon occupancy. The titles are now obtained by deed from non-consenting owners, following the prescribed provisions of the Code. Records are in fair condition, and cover the general form required by law, supplemented by maps filed in the Surveyor's or Clerk's office.

Manner of Construction and Maintenance: By day's labor. Contract system tried in construction, but discontinued.

Accounts: Are not segregated nor itemized to show results of expenditures. Labor certificates are assigned to foremen; warrants drawn in their favor.

Raising Money: By property and poll tax. $157,000 bonds issued in 1894, realizing $157,942. Transfers also made from contingent and other funds.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.			Amount.
	Bridge.	Road.	Total.	
1895	2	16	18	*$84,791 58
1894	3	12	15	200,528 06
1893	6	22	28	27,950 70
1892	3	22	25	30,614 95
1891	3	23	26	30,345 91
1890	5	23	28	34,351 74
1889	5	20	25	41,385 07
1888	11	20	31	25,766 51
1887	20	18	38	21,633 93
1886	--	18	18	17,663 25
Total				$496,031 78

*This sum includes $21,553 48 bond fund in treasury, available fiscal year 1895-96.

Kern County lies across the southern end of the great valley of California, and extends from the crest of the Coast Range across the Sierras and into the arid lands east and south of that range. About one fourth of the county is nearly level valley land; the remainder is rolling and rugged. Within the limits of the county are four important passes: Walkers, Tehachapi, Tejon, and San Luis, the former offering the best route to the southeast, the second and third to the south, and the latter to the northwest, out of the great valley of California.

There is an abundance of road-building material in the county; the alkaline clays and adobes, when mixed with coarse sand in proper proportions, make an excellent road surface. Hardpan is available over large areas of the valley, and volcanic and metamorphic rocks in the mountains. Fine bitumens and asphalts occur in the western part of the county.

Water is naturally scarce, but the system of irrigation has introduced a gravity and artesian supply over the settled areas of the county, which supply can be augmented by additional surface and artesian wells.

There are about 155 bridges in the county, ranging from 25 to 960 feet in length. The records do not show the cost of constructing or of maintaining them. One, in the limits of Bakersfield, across an irrigation canal, was originally built and maintained as a wooden structure. It cost about $600 to construct and $200 a year for plank; labor not ascertainable. This bridge was recently replaced by a brick inverted siphon. This structure cost $1,300, and needs no repairs. On the basis of a 6% investment, and taking only the cost of lumber at $200 per year, the perishable wooden structure represented an outlay of $3,333 33. The wastefulness of this type of structures becomes apparent.

The county has an erroneous method of paying for road work. The claims of parties doing work are assigned to the foreman, who draws the warrant and discharges the claim. This system has been criticised locally, but no remedy seems to have been made. Excessive costs for surveys have also been a source of extravagant outlay. When necessary to secure a thoroughly correct location and exact data for contracts, no outlay is more economical than that expended in judicious surveys, but this, like other public expenditures, is liable to abuse.

The county and several districts own a light road-roller and road-grader. Several miles of road adjacent to Bakersfield are sprinkled, toward which the county funds contribute $75 per month, the remainder being made up by subscription.

KINGS COUNTY.

Organized: 1891.

Area: 1,257 square miles.

Visited: February 17, 1896, by Commissioners Irvine and Maude; July 14, 1896, by Commissioner Manson.

Mileage: 375.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; number of miles graded, not known.

Title and Records: Titles are those coming from use at organization and upon properly acquired titles since the formation of the county. The mode of acquiring titles to rights of way is that prescribed in the Code. Records consist of (1) road record book, in which are recorded the data prescribed in the Code; (2) a separate road minute book; (3) a road plat book, containing surveys of roads, scale ¼ inch to 1 mile.

Manner of Construction and Maintenance: Generally by day's labor.

Accounts: Are not kept by districts, but mainly by filing claim and recording in allowance book, not definite as to exact locality and extent of work done.

Raising Money: By direct property tax only.

Amount Expended in Past Three Years.

Year.	Rate in Cents per $100.	Amount.
1895	20	$6,564 45
1894	13	6,476 40
1893	18	7,882 60
Total		$20,923 45

Kings County lies in the depression of the great valley of California, around and including Tulare Lake. Three fourths of the county is nearly level valley land; the remainder, lying in the western part of the county, and extending to the crest of the Coast Range, is rolling and mountainous.

Road-building materials, except alkaline clays and adobes and sand, are scarce in the valley portions. These, if properly mixed and treated, make good surfaces. In the southwest portion of the county, asphalts and volcanic and metamorphic rocks occur.

As in Tulare County, water is naturally scarce, but an extensive irrigation system renders water available. This supply can be increased by surface and artesian wells.

The county owns two light road-rollers (6 tons), one grader, and a miscellaneous lot of scrapers, etc. No full list of road machinery and tools is kept.

The value of culverts and bridges is $16,654, upon which is expended in repairs about 16% of their value, or 25% of the gross road revenue. In no county could the use of durable materials, such as salt-glazed sewer-pipe, concrete, or masonry give more beneficial results.

LAKE COUNTY.

Organized: 1861.

Area: 1,332 square miles.

Visited: January 23, 1896, by Commissioner Manson; August 27, 1896, by Commissioner Irvine.

Mileage: 475.

Improved: No miles macadamized; 100 miles graveled; no miles sprinkled; 350 miles graded.

Title and Records: Title to most of the roads is imperfect, but for the past few years an effort has been made to get deeds to the rights of way. It is obtained by declaration, purchase, and grant. Records are in very poor condition, and the road register is not kept up. In fact, no effort is made to record road matters. The Assessor's map shows all roads at the time the map was made, but it is not brought up to date.

Manner of Construction and Maintenance: By day's labor, under personal supervision of Supervisors.

Accounts: Are kept in the supervisoral districts, which are not subdivided.

Raising Money: By direct tax on all outside property, and by road poll tax. Transfer of $2,000 from general county fund for bridge purposes. $17,500 in bonds (see footnote).

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$14,125 53
1894	40	13,461 87
1893	37	13,340 88
1892	37	12,790 53
1891	37	12,392 24
1890	36	10,801 27
1889	30	11,345 56
1888	35	10,312 49
1887	35	11,498 79
1886	35	10,086 61
Bonds*		17,500 00
Total		$137,655 76

* Bonds—Year of issuance not known.

Lake County is irregular in shape, lying between the extreme eastern crest of the Coast Range Mountains and the middle range of same, Clear Lake forming a basin almost in the center.

The valleys and lowlands, suitable for agriculture and dairy interests, constitute only a small percentage of its area. The mountains are steep and rugged. As a consequence, the roads are steep and exceedingly difficult to maintain. This is notably the case in the road from the landing on Clear Lake to Bartlett Springs, which is very steep and in some places dangerous. Toll roads are numerous, and, as a rule, are well located; especially so is the one from Highland Springs to Pieta. In fact, all the passes into the county are under the control of corporations, and the toll exceeds the road tax. A well-located road was built on the shores of the Blue Lakes by the people, who subscribed cash and labor in order to escape the burdensome toll tax.

Building material is plentiful in all portions of the county, and gravel is abundant both in deposits and in streams.

Trap, shales, and serpentine abound in many sections; the last named being used in some instances, making a good road surface. Many miles of the valley roads are well graded and graveled and in good condition. No sprinkling has been done in this county, though water can be readily obtained by gravitation from the numerous springs and streams and by pumping from wells. No attention whatever is paid to drainage, and in consequence, many of the mountain grades are annually washed away. The rainfall is 32 inches annually, and in many seasons is enormous.

This is one of the few counties in which the Board of Supervisors has complied with the provision of Section 2738 of the Political Code, relating to sign-boards, which are to be found at nearly every cross road.

LASSEN COUNTY.

Organized: 1864.

Area: 4,750 square miles.

Visited: December 13, 1895, by Commissioner Manson; August 28, 1896, by Commissioner Irvine.

Mileage: 710.

Improved: No miles macadamized; 5 miles graveled; no miles sprinkled; 75 miles graded.

Title and Records: Title to at least nine tenths of the mileage is very imperfect. It is secured by declaration, purchase, and grant. Records, excepting those for the past few years, are not reliable.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioners and deputies.

Accounts: Are kept against five districts only.

Raising Money: By direct taxation on all property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$8,018 31
1894	38	9,829 16
1893	35.4	9,862 53
1892	30	7,424 56
1891	30	6,616 26
1890	25	6,966 42
1889	20	5,057 78
1888	30	7,610 33
1887	30	8,514 26
1886	33	7,611 90
Total		$77,621 53

Lassen County is bounded on the north by Modoc, on the west by Shasta, on the south by Plumas County, and on the east by the State of Nevada. It lies on the east of the Sierras, and is a succession of mountain ranges. Lassen Buttes, rising to an elevation of over 10,000 feet, are the highest peaks. About 600 square miles are valley land, 500 square miles rolling, and the remainder, mountainous.

Road-building materials, consisting of gravel, granite, limestone, trap, and volcanic formation, are to be found in different sections of the county. The available supply, however, is limited, for, as a rule, the materials mentioned occur too far from the roads.

Water in abundance for sprinkling purposes may be developed by wells in the level sections and by gravitation from the numerous streams.

The mountain grades are steep and narrow, and as a rule are poorly located, the idea of construction on lines that require the least outlay evidently having prevailed in laying them out. Before any good results can be expected, many miles of road must be relocated. Some good grading and graveling have been done near the county seat.

The soil through the valleys is of such a nature that it makes an excellent roadbed, and, to make a good road, all it requires is better drainage and proper grading.

Very little attention is paid to drainage, and as a natural consequence, the rains and snows do great damage. Many miles of roads are annually maintained that might be economically abandoned, as the travel is insufficient to warrant any outlay. Only a few of the roads are kept open in the winter months, as the snow is very deep on the mountains.

Bridges are numerous, but most of them are of wood and need constant expenditures to keep them in repair for travel.

The average annual rainfall is about 23 inches, and of snow, about 90 inches, the latter from November to March, the heaviest in December and January.

LOS ANGELES COUNTY.

Organized: 1850.

Area: 3,957⅙ square miles.

Visited: February 6, 1896, by Commissioners Maude and Irvine; August 17, 1896, by Commissioner Maude.

Mileage: Never ascertained; about 1,200 miles.

Improved: 10 miles macadamized; 40 miles graveled; 50 miles sprinkled; 200 miles graded.

Title and Records: Title to old roads is defective; to new roads it is good. Probably 60% of roads have title in more or less perfect form. All titles now being perfected. In former years no method of obtaining title seems to have followed—simply a declaration. Of late years, the method prescribed by the Codes has been followed. Records previous to 1880 are poor; since then they have been kept better. A systematic effort is now being made to get records in proper form.

Manner of Construction and Maintenance: Contract for large pieces of construction; day's labor for other construction and maintenance.

Accounts: No accounts other than vouchers and those ordinarily kept by Auditor. Supervisoral districts subdivided into road districts, each district having its particular fund.

Raising Money: By direct levy on all outside property and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$88,543 10
1894	30	95,825 29
1893	30	80,833 54
1892	25	83,054 26
1891	30	125,892 01
1890	30	86,061 88
1889	30	99,911 45
1888	20	104,225 14
1887	25	58,778 95
1886	20	61,620 20
Total		$884,745 82

The confines of Los Angeles County embrace level valley land and rugged mountains. The main valley area, located in the southwestern portion of the county, is at present the site of the homes of the major part of the population of the county. Here are located the cities of Los Angeles, Pasadena, Pomona, and Santa Monica; while the outlying country is as densely populated as are areas of like size in many of the far Eastern States. Improved highways mean the still further development and prosperity of this suburban district, and through it the prosperity and further growth of the cities above mentioned. In considering the road problem this section must be dealt with separate and apart from the rest of the county, owing to the different conditions of topography, climate, soil, settlement, and requirements demanded by them.

Gravel, disintegrated granite, granite, limestone, porphyry, and other igneous rocks, together with hardpan, are found scattered through the county, and some of these varied materials are available in almost all sections. Water for sprinkling purposes is obtainable in almost all localities.

The rainfall varies from 14 to 16 inches per annum, and is precipitated from November to April.

Climatically, there is never enough cold to affect roads, while in the summer months the heat is not so severe as in other localities farther removed from the sea coast and its ameliorating influences.

The soil, being largely composed of decomposed granite with an admixture of iron, is heavy and non-absorbent in character. This fact, taken with the small amount of rainfall, warm climate, and generally clear sky, which permits an unrestricted action of the sun's direct rays upon the road surface, generally prevents mud on even illy drained earth roads. For the same reason, dust is the great enemy to be contended with during the long dry season.

The use of more permanent materials in the construction of culverts is strongly recommended, such as vitrified pipe for the smaller ones, and concrete or brick for those of larger dimensions.

A careful and frequent inspection of bridges requiring repairs should be made, to the end that the life of the bridges may be prolonged by repairing whenever necessary. The utilization of a wearing material as a covering for bridge flooring, such as bitumen or asphaltum, is recommended. The result would be that instead of planking having to be repaired every year or two the asphaltic surface would last for from eight to ten years with but little repair necessary.

The planting of trees of a deciduous nature along the sides of the highways should be inaugurated. Trees of this character should be planted so that their foliage may shade the roadway during the heat of summer, while during the wet winter months their barren limbs offer no obstruction to the rays of the sun, which remove all excess moisture. The further development of sprinkling should be carried on as rapidly as available funds will permit.

The careful cross-sectioning of roads is recommended. This should be about ½ inch to the foot. The roads are in many instances excessively and unnecessarily wide. The width should be reduced to 60 feet, of which not over 24 feet should be prepared for roadway, the remainder being left for ditches, trees, and footways.

The varied materials suitable for road-surfacing should be more fully utilized.

The Board of Supervisors is to be commended upon the energy it displays in correcting and perfecting the road records and maps. Under its direction a complete set of road maps is now being prepared by the County Surveyor, while the Clerk of the Board has prepared an index of roads and all proceedings connected therewith, that is of great value. In this county the Bureau of Highways found the only complete list of road machinery kept in any county of the State. This is a matter of great importance, and should be followed by other counties.

In the mountain portion of the county, the road problem is more one of construction than of maintenance at the present time. Owing to the sparse settlement, there is comparatively light travel over such roads, and as a consequence they rarely become muddy or dusty. As a general rule, the soil conditions are favorable for good earth roads. The problem of drainage is comparatively easy of solution. The drains should be so constructed that there will be no washing of the roadways. In a majority of instances there are trees which serve to shade the roadway. The matter of location is an important one. The roads should be located so that the grades will not exceed 8%. Maintenance will consist in most instances of repairing the washes, removing fallen trees, etc.

In the northern, or so-called arid region, the effort should be made principally to secure rights of way, so that when the country is put under irrigation, and consequently well settled, the work of improvement can be systematically carried forward.

MADERA COUNTY.

Organized: 1893.

Area: 2,140 square miles.

Visited: February 24, 1896, by Commissioner Irvine; July 7, 1896, by Commissioner Manson.

Mileage: 395.

Improved: No miles macadamized; no miles graveled; ¾ mile sprinkled; 225 miles graded.

Title and Records: Roads are opened in the manner prescribed by law. The records consist of the prescribed form—filed and recorded deeds. Plats and surveys filed in Clerk's and Surveyor's offices. Indexes not yet found necessary.

Manner of Construction and Maintenance: By day's labor.

Accounts: Claims are filed by the individuals doing the work, and warrants drawn in their favor and entered in Allowance Book, which designates the district or other fund from which payment is to be made; locality and extent of work done not definitely given.

Raising Money: By property and poll tax.

Amount Expended in Past Three Years.

Year.	Rate in Cents per $100.	Amount.
1895	34	$26,318 39
1894	25	19,264 77
1893		*511 20
Total		$46,094 36

* This amount transferred from Fresno County road fund. No tax raised for fiscal year 1893.

Madera County extends from the San Joaquin River to the crest of the Sierras, the river forming the border line throughout the western and southern sides, and draining the greater portion of this mountain area. The valley portion occupies about two fifths of the area of the county, and the remainder rises from the floor of the valley to elevations of from 10,000 to 13,000 feet above tide.

In the valley only limited deposits of gravel occur. Alkaline clays, adobes, and sand are available. Throughout the mountain area, disintegrated granite, trap, and volcanic and metamorphic rocks exist.

Water is available in irrigated portions, and can be developed from artesian and surface wells.

MARIN COUNTY.

Organized: 1850.

Area: 516 square miles.

Visited: July 8, 1895, by Commissioners Manson and Irvine; September 15, 1896, by Commissioner Manson.

Mileage: 235.

Improved: No miles macadamized; no miles graveled; 3 miles sprinkled by subscription. Miles graded not known.

Title and Records: Roads are opened in the manner prescribed in the Code, but alterations are sometimes made without petition, on motion by the Board of Supervisors. The records are in fair condition and consist of the road register, full indexed reference to road proceedings, and maps filed with the Clerk and Surveyor.

Manner of Construction and Maintenance: Contracts are generally let for extensive grading. One road under construction by convict labor upon agreement between the Board of Prison Directors and the Board of Supervisors.

Accounts: Warrants are drawn in favor of the individuals doing work, and accounts are kept against district and general road fund, as well as entered in the allowance book. But the exact cost of improvement done upon any particular road is not ascertainable.

Raising Money: By property and poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	22	$20,215 85
1894	21	23,826 49
1893	19	22,699 96
1892	20	22,241 70
1891	18	21,209 70
1890	17	16,336 35
1889	19.8	21,768 25
1888	20	22,498 10
1887	20	19,351 65
1886	22.5	21,638 89
Total		$211,846 93

Marin County extends from the Golden Gate, northerly for 60 miles along the ocean, and 30 along the Bay of San Francisco. The greater portion of the county is rolling and mountainous, rising from tide level to elevations of 2,600 feet.

Road-building materials are well distributed over the county, in the form of gravels and volcanic and metamorphic rocks.

Water can be obtained from springs and streams, and can be pumped near tide level from the bay and estuaries. The moister climate on the west exposures renders road-sprinkling less necessary than on the eastern exposures. Sprinkling is done for several miles, from San Rafael to Ross Valley, by subscription.

The districts own road-scrapers, but no official record is kept of road-building machinery.

The advantages of a careful location have not always been followed, for in 1893 the grade of the road from Sausalito over Corte Madera ridge to San Rafael was specified by the County Surveyor to be not less than 5%; yet it was opened in 1895 upon grades as high as 12%.

MARIPOSA COUNTY.

Organized: 1850.

Area: 1,580 square miles.

Visited: August 28, 1895, by Commissioners Manson and Irvine; June 27, 1896, by Commissioner Manson.

Mileage: No information could be obtained from the County Surveyor regarding road mileage in this county.

Title and Records: The titles to the older roads rest upon usage and sufferance. There is no road register, but a franchise book of toll roads. New roads are opened in the general manner prescribed in the Code. Records are deficient and lacking.

Manner of Construction and Maintenance: By day's labor generally. Contract and agreement in special cases.

Accounts: The erroneous practice of drawing warrants in favor of the Road Commissioner prevails. No special system of road accounts kept.

Raising Money: By property and poll tax. $15,000 6% bonds issued in 1895.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$21,801 18
1894	23	4,886 98
1893	23	5,122 08
1892	22	4,251 99
1891	23	4,907 42
1890	40	7,156 67
1889	17	3,648 87
1888	30	5,700 27
1887	22	3,996 04
1886	27	4,803 79
Total		$66,275 29

Mariposa County occupies the slopes of the base of the Sierras, from the foothills eastwardly to the crest. The Merced River flows through and drains the greater portion of the county. Nearly the entire area is rolling and mountainous. The upper third of the county is within the Yosemite Reserve. The foothill regions are mostly slate, but harder rocks occur, which can be utilized for road-surfacing.

Water can be developed for road-sprinkling only at considerable cost, and is not abundant.

Considerable improvement and increased interest in road construction and management were noted between the first and second visits of the Bureau. Systematic relocation and construction alone will yield best results for this county.

MENDOCINO COUNTY.

Organized: 1850.

Area: 3,460 square miles.

Visited: January 21, 1896, by Commissioner Manson; August 25, 1896, by Commissioner Irvine.

Mileage: 1,200.

Improved: No miles macadamized; 10 miles graveled; no miles sprinkled; 800 miles graded.

Title and Records: Title to about 20% of the roads is perfect, but balance of roads are used simply by sufferance. Records are poorly kept; no road register. Title secured by purchase, condemnation, dedication, and grant.

Manner of Construction and Maintenance: By day's labor, under supervision of foremen appointed by Road Commissioners.

Accounts: Are kept in ledger form against each district only; not against any particular road.

Raising Money: By direct tax on outside property, and by road poll tax. Books also show transfers from other funds to road fund; $68,000 bonds issued in 1886, and $20,000 in 1892.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	36	$47,823 25
1894	34	46,515 45
1893	31	40,470 40
1892	34	64,745 45
1891	38.4	42,180 00
1890	40	44,220 00
1889	52.2	43,820 00
1888	40	43,040 00
1887	40	35,840 00
1886	40	100,164 00
Total		$508,518 55

Mendocino County lies south of Humboldt County, the greater portion being exceedingly mountainous and heavily timbered. Some small valleys and low bottom lands are to be found, but these constitute only a very small portion of its area. Road-building material is to be found in unlimited quantities, but very little of it has been used on the highways. Gravel abounds in all the main streams and is easy of access, while on all the mountain grades vast ledges of shale of a superior quality are encountered; but it has never been utilized. There is not another mountain county in the State where such an abundance of material suitable for road-building is accessible as in this county, and yet no advantage has been taken of the fact.

Water is plentiful from the springs and natural waterways on most of the grades, while in the valleys it can be had by pumping. The grades are excessively steep, and in one instance a road was surveyed and constructed on a 25% grade when the same altitude could have been economically reached by a grade not exceeding 8%.

The rainfall is excessive, being as high as six feet in some seasons. With this rainfall, and the grades constructed as they are, it is almost an impossibility to maintain the roads, and for months during each year travel and freight and lumber teaming are out of the question. There is not another county that needs the relocating of roads so much as Mendocino. Many bridges and culverts must be maintained, and a large amount of the taxes raised is thrown away on temporary structures. No attention is paid to drainage of these steep grades, and some of them are simply ditches to drain the enormous watersheds. The supervisoral districts are subdivided into thirty-two road districts, and when the funds are apportioned there is not enough in any one road district to do anything but patch-work.

Along the coast are many miles of sand roads, and near to all of these sandy stretches are unlimited supplies of excellent cement, gravel, and shale, which, if utilized, would convert these roads into splendid highways.

The average rainfall is 33 inches at Ukiah; but the northwestern portion of the county lies within the 50-inch belt.

MERCED COUNTY.

Organized: 1855.

Area: 1,750 square miles.

Visited: August 30, 1895, by Commissioners Manson and Irvine; July 1, 1896, by Commissioner Manson.

Mileage: 400.

Improved: No miles macadamized; 60 miles graveled; no miles sprinkled; 110 miles graded.

Title and Records: Titles are in good condition, owing to the system of surveying and recording plats. The methods prescribed in the Code for opening, closing, and altering roads are closely followed, and are supplemented by forms issued by the Clerk and Surveyor. The road records of the county are in excellent condition, although the system adopted has not been kept up of recent years. The forms gotten up will be useful in preparing general forms for the other counties.

Manner of Construction and Maintenance: Construction, grading, and graveling done by contract, with good results; repairs and maintenance by day's labor.

Accounts: Are in good condition. Claims are presented by the party doing work, approved by Road Commissioner, and audited by the Board, but do not definitely show exact location and extent of work done.

Raising Money: By property tax. No poll tax collected since 1857. Of the total amount shown for ten years, $800 was subscribed.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	34	$46,965 25
1894	34	59,495 59
1893	40	48,220 40
1892	40	63,103 50
1891	40	57,337 73
1890	40	52,409 38
1889	40	50,373 50
1888	40	59,671 48
1887	40	46,264 60
1886	25.5	32,683 52
Total		$516,524 95

Merced County extends eastwardly from the crest of the Coast Range across the great valley of California to the base of the Sierras. Three fourths of the county lies within the valley, and the remainder is rolling and mountainous. The San Joaquin River flows through the county from north to south, and divides it into nearly equal portions. The Merced flows through the eastern half of the county near its northern border. Smaller Sierra streams water the southeastern portion of the county.

The soil of the valley portion varies from sandy to adobe, each requiring special treatment in regard to drainage and surfacing. The sandy roads are frequently "strawed," at a cost of about $35 per mile. This works into the sand and lasts several weeks under heavy teaming. It is sometimes necessary to straw the road twice in a season in order to haul grain to the depots. Systematic work would do much to relieve the county of this drain.

The road machinery consists of one 7-ton road-roller, bought by Districts 2 and 3, and five graders, owned by the districts.

The estimated cost of bridges in the county is $79,600.

(The Bureau is indebted to the County Surveyor for excellent data and information regarding roads and road structures.)

MODOC COUNTY.

Organized: 1874.

Area: 4,097 square miles.

Visited: December 17, 1895, by Commissioner Manson; July 23, 1896, by Commissioner Irvine.

Mileage: 683.

Improved: No miles macadamized; 10 miles graveled; no miles sprinkled; 200 miles graded.

Title and Records: There is regular title to but a very small portion of the roads, acquired by purchase, condemnation, and grant; by balance by sufferance. Records are in poor condition. But little reliable data can be obtained from them. However, an attempt is being made to straighten them out.

Manner of Construction and Maintenance: By day's labor, under supervision of the Road Commissioner.

Accounts: Are kept in fourteen separate funds.

Raising Money: By direct tax on all property, and by road poll tax. Following table includes transfers amounting to $640.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	27.5	$8,216 73
1894	30	9,244 63
1893	25	8,722 66
1892	25	9,121 86
1891	35	11,801 94
1890	25	8,441 71
1889	18.8	6,901 23
1888	16	6,743 51
1887	18	7,332 77
1886	20	7,294 38
Total		$83,821 42

Modoc County is situated in the extreme northeastern corner of the State, and extends from Lassen on the south to the Oregon line on the north. It is rolling and mountainous, interspersed with some large fertile valleys. A portion of the county is of volcanic formation, and the lava beds constitute a large percentage of its area.

Gravel suitable for road purposes is found near Alturas, and trap and volcanic matter, specially good for road purposes, are found in unlimited quantities in almost every section of the county.

Water for sprinkling purposes is scarce in the valleys, but plentiful in the mountains.

The roads in the mountains are poorly located and extremely difficult to maintain, while in some of the valleys the soil is naturally gravelly and exceptionally good, and consequently the keeping of the roads in repair is inexpensive. There is one very good natural stretch of road in Surprise Valley, over 25 miles in length, the maintenance of which costs practically nothing. The formation is of a fine gravelly soil that cements very closely, and resists the action of vehicles and of the elements.

The valley lands range in elevation from 4,000 to 5,000 feet above sea-level, while some of the mountains reach an altitude of 7,500 feet.

Average rainfall, Fort Babbitt, 11.80 inches; Fort Bidwell, 20.06 inches. Snow falls, varying in depth from 15 inches in the valley to 10 to 15 feet in the mountains.

MONO COUNTY.

Organized: 1861.

Area: 2,796 square miles.

Visited: February 17, 1896, by Commissioner Manson; August 12, 1896, by Commissioner Manson.

Mileage: 374.

Improved: 85 miles toll road; 239 miles "worked" and partly graded; no miles sprinkled; 50 miles not worked.

Title and Records: The roads and trails were, as a general proposition, laid out and operated prior to land ownership, but they have been changed informally, and hence, title would have to be established. No deeds recorded.

The prescribed legal method is followed in opening roads. Highways have been illegally closed and fenced up without formal abandonment by the Board of Supervisors. An abstract of the minutes of the Board relative to road work has been kept from 1861 to 1891. Some surveys and plats are also on file, as are Road Commissioner's reports.

Manner of Construction and Maintenance: Mostly by day's labor.

Accounts: Are kept in a fair way, but the principal method is by filing claim warrant drawn to the individual doing work, and entered in allowance book. Exact location and amount of work not definitely recorded.

Raising Money: By property and poll tax. Books also show transfers of funds.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	10	$1,983 13
1894	10	1,338 28
1893	10	1,531 27
1892	10	1,749 31
1891	10	1,404 28
1890	..	1,044 00
1889	10	1,428 91
1888	4.2	873 28
1887	6	1,494 82
1886	8.6	1,173 78
Total		$13,986 86

This county extends eastwardly from the crest of the Sierras to the State line, and adjoins Alpine on the north and Inyo on the south. The greater portion of the county is rough and mountainous. The valleys are at an altitude of over 7,000 feet, and are partly watered by streams from the Sierras.

The principal physical feature of the county is the Mono Lake basin, a separate drainage system, within the Humboldt basin. Its western crest rises to elevations of 13,000 feet, and the lake has an elevation of 6,380 feet. There are several passes over the Sierras within the limits of Mono County, the principal of which are McLane's Pass (at the head of Leevining Creek), Sonora Pass, and Bloody Cañon. A much needed connection lies between the Mono and Tuolumne roads via the first or last-named pass, as this connection lies south of the almost impassable cañons of the Stanislaus and Tuolumne rivers, and avoids the great detour via Sonora Pass. One of the members of the Bureau made a careful examination of these passes, as their importance to widely separated sections of the State warrants aid in the construction of the connecting road.

In conjunction with other counties, Mono has in the past issued about $43,000 in bonds for the construction of roads leading eastwardly over the Sierras, but the county is now commercially and industrially tributary to Nevada.

The rights of the public to trails and roads have been infringed upon by illegal fencing and closing, and no steps have been taken by the Road Commissioners to abate these abuses.

The county is abundantly supplied with hard volcanic and metamorphic rocks for road-building.

Water is scarce, the rainfall in the larger portion of the county being less than 10 inches per annum, though on the higher elevations of the Sierras it is as high as 50 or 60 inches per annum, most of the latter being precipitated in the form of snow.

The value of the bridges in the county is about $6,730.

The county owns a road-grader costing $408, plows and scrapers.

(The Bureau is indebted to the County Clerk, Mr. J. D. Murphy, and to the Sheriff and Tax Collector, Mr. M. P. Hayes, for courteous assistance in the collection of road data.)

MONTEREY COUNTY.

Organized: 1850.

Area: 3,450 square miles.

Visited: December 10, 1895, by Commissioners Maude and Irvine; July 22, 1896, by Commissioner Maude.

Mileage: Not accurately obtainable, on account of lack of records. About 600 miles.

Improved: 3 miles macadamized; 18 miles graveled; no miles sprinkled; about 20 miles graded properly.

Title and Records: Titles secured prior to 1891, generally defective. But little attempt seems to have been made to perfect same. Records are very defective, and are not well indexed or properly filed, and hence, are unavailable.

Manner of Construction and Maintenance: Contract system and day's labor have both been employed, with varying results. Contract system has not proved a success as applied to maintenance.

Accounts: No accounts are kept other than the ordinary vouchers, which, in some instances, are not properly itemized.

Raising Money: Money is raised by direct tax, poll tax, and transfers from current expense, salary, and other funds. Bridge bonds to the amount of $150,000 were issued in August, 1889, sold for $150,375; interest 5%, payable semi-annually. In 1878, there were issued $23,000 worth of bridge bonds, which were redeemed in 1888.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	20	$29,857 16
1894	18	30,709 81
1893	24	42,826 43
1892	22	33,708 86
1891	24	35,653 50
1890	40	197,153 92
1889	18	26,454 40
1888	18	27,245 21
1887	20	23,498 36
1886	18	15,795 90
Total		$462,903 55

Topographically, the settled portion of the county, which is the portion traversed by roads, is level, being situated in the Salinas and Pajaro valleys. The remainder of the county, situated in the Coast Range, is mountainous, but on account of sparse settlement and little travel, but few highways are necessary.

Gravel is found in the Pajaro River, and a good quality of disintegrated granite near Soledad. Hard granite, suitable for road-metal, is found near Monterey, but is somewhat inaccessible. Limestone deposits exist throughout the mountains, and can be made available for road-metal. Other igneous rocks exist in the county, but in small quantities, and are generally inaccessible. Bituminous rock of excellent quality is found in many localities. Two quarries are worked by private individuals, one near Metz and one near King City.

Water for sprinkling can be had in the Pajaro Valley and in the country adjacent to the cities of Monterey and Salinas, the sources being wells, ponds, and streams. In the Salinas Valley the supply of water is inadequate, and that which is available is not easily obtainable. The annual rainfall is between 12 and 13 inches.

The portion of the county situated in the Salinas Valley is subjected to great heat and drying winds during the summer months.

The soil in the Pajaro Valley and adjacent to Monterey and Salinas is of a heavy nature, retaining water, and as a result the roads in this section are in a deplorably muddy condition during the rainy season.

In the Salinas Valley, the rainfall being less and the soil conditions different, mud is not so serious an impediment to traffic. Two distinct methods of highway construction must be utilized in this county. In the Pajaro Valley and the sections adjacent to the cities of Monterey and Salinas, drainage and metaling of the road surface are absolutely necessary. Through the Salinas Valley a proper cross-section must be given the roads. Aside from this, but little can be done.

The methods of maintenance of the highways must also vary in these two sections. The metaled roads must, of course, have worn-out or displaced metal renewed. Sprinkling is also essential where practicable. Maintenance throughout the Salinas Valley is a more difficult problem, on account of the scarcity of water. Where it can be obtained the roads should be sprinkled, and to conserve the moisture thus artificially applied, a systematic effort should be made at wayside tree-planting.

The Board of Supervisors of this county is deserving of praise for its efforts looking toward systematic road improvement. One of the districts, with but a small road fund, in conjunction with the City of Salinas, has purchased a rock-crushing plant with all its adjuncts. The plant being small and portable, can be readily moved from point to point, as necessary. At present it is employed in crushing a species of limestone at a quarry some 4 miles from Salinas. This may be said to be practically the first systematic attempt made in this county at road-building. Three miles of macadamized road have been built, presaging much good for the future prosperity of this county.

NAPA COUNTY.

Organized: 1850.

Area: 800 square miles.

Visited: June 29, 1895, by Commissioners Manson, Irvine, and Maude; September 2, 1896, by Commissioner Irvine.

Mileage: 550.

Improved: 50 miles sprinkled. Further data as to classification unobtainable, except as given below.

Title and Records: To only a very small proportion title is perfect; the remainder of the roads being used by sufferance and dedication. Records are in good condition for roads recently laid out, but for older roads no data available.

Manner of Construction and Maintenance: By day's labor. Payments for labor are made by the Road Commissioner in person, and he makes a quarterly report to the Board of Supervisors, and warrant for the amount is drawn in his favor.

Accounts: Are kept against fourteen road districts, and funds kept separately.

Raising Money: By direct tax on all outside property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	38	$33,102 82
1894	35	34,954 71
1893	30	32,068 67
1892	30	32,835 43
1891	30	33,168 10
1890	33	36,196 98
1889	30	34,858 23
1888	25	29,354 83
1887	26	26,380 09
1886	25	23,720 95
Total		$316,640 81

Napa County, like Lake, is extremely irregular in shape, the crest of the eastern and middle ranges of the Coast Range Mountains forming its eastern and western boundaries. Napa Valley, together with other smaller valleys, constitutes about one fifth of the whole area, the remainder being rolling and mountainous.

Road-building material is abundant, and consists of gravel, trap, basalt, and shale; gravel in unlimited quantities is to be found in all the streams, while the other varieties of material occur in various portions of the county. Stone for bridge purposes is plentiful and has been utilized to great advantage.

This county leads all others in the introduction of permanent structures, having constructed nine stone bridges, ranging in length from 50 to 300 feet. The shorter bridges consist of single arches, spanning the smaller streams, and giving abundant waterway during flood seasons. The longer bridges consist of arches in series. The spans of these longer bridges vary from 55 to 70 feet for each arch.

Two of the larger bridges deserve special mention. The first constructed was over the Napa River, near St. Helena. This bridge is 212 feet in length over all, and has three 55-foot arches, with piers and abutments resting on bedrock. The center arch is somewhat higher than the others. The second is over Putah Creek near Monticello, and is a somewhat larger and more imposing structure. It consists of three 70-foot arches carried down to bedrock. This structure is illustrated in the report. The center span is 42 feet above low water. The abutments are 6 feet below the surface, resting on bedrock. The piers are 16 feet at the base and 10 feet at spring line, and also rest on bedrock. The arch stones are 3 feet 6 inches deep, $12\frac{3}{16}$ inches at crown, and 11 inches at base, laid in cement mortar. The stone used in the bridges is a native sandstone, and is found in abundance near the site. It is extremely strong, having stood a test of 8,000 to 12,000 pounds pressure to the inch.

There were used in the construction of the last-mentioned bridge $2{,}600\frac{5}{16}$ cubic yards of material, 675 barrels of cement, 380 barrels of lime, 55,000 feet of lumber for false work, and $1\frac{3}{4}$ tons of iron. The only article purchased outside of Napa County was the cement. The entire cost of the bridge was $19,980, while the two combination wooden-iron bridges erected at this point represent in their construction and maintenance an outlay of $53,000, and yet, after this enormous outlay, all there was to show for it was a pile of broken and rotten timbers. This county has expended in the construction of the nine stone bridges less than $50,000, and the maintenance of these structures will be nominal. The economy and permanence of stone bridges are seen at a glance, and the example set by this county is worthy of emulation.

The roads in the valley are well graded, and macadam has been used on about 1½ miles. Gravel has been used extensively, and one road is well graded, graveled, and watered for 30 miles, making as good a stretch of road of that length as there is in the State.

Water for sprinkling is obtained principally by pumping with horse-power and windmills. In some instances, water is purchased from private tanks. It is to be noted, however, that in such cases an unusual price is exacted, notwithstanding the fact that the water is used to sprinkle the road on which the land of the party furnishing the water abuts.

Many of the roads are poorly located and correspondingly difficult to maintain, but an effort is being made of late to reduce the grades.

The average rainfall is between 25 and 31 inches.

NEVADA COUNTY.

Organized: 1851.

Area: 958 square miles.

Visited: October 28, 1895, by Commissioners Manson and Irvine; August 18, 1896, by Commissioner Irvine.

Mileage: Approximately 500.

Improved: 5 miles macadamized; 10 miles graveled; 4 miles sprinkled; 300 miles graded.

Title and Records: To the major portion, title is defective, though of late years an effort has been made to obtain deeds. Title is secured by purchase, condemnation, and grant. Records are in fair condition, and all new roads are surveyed, mapped, and recorded; but the majority are not of record.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioner.

Accounts: There are but five districts, and accounts are kept against each one.

Raising Money: By direct taxation, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$18,584 82
1894	40	17,016 99
1893	40	18,529 16
1892	40	24,433 93
1891	40	18,650 94
1890	40	18,212 69
1889	40	19,862 46
1888	40	20,534 86
1887	40	19,539 12
1886	40	18,506 40
Total		$193,863 37

This county extends from the valley of the Sacramento, at an elevation of 1,000 feet, to the summit of the Sierras, 8,000 feet high. The Middle Yuba bounds it on the north, and the South Yuba and Bear rivers form its southern boundary. It is a narrow county, like Placer, and embraces various features. The western portion is tillable, the central part is rolling, being made up of small valleys, and the remainder is extremely mountainous.

So far as road-building material is concerned, this county is extremely fortunate. Quantities of granite, trap, basalt, and quartzite abound, while some gravel is found in all the streams. Immense deposits of waste material, or "dumps," as they are called, from the numerous quartz mines, need only the action of a crusher to be converted into excellent road-metal. As the greatest expense in preparing crushed rock is the quarrying, by utilizing these "dumps," which are conveniently located, the cost of production could be reduced to a minimum.

Some of the recommendations of the Bureau of Highways have been inaugurated, and the indications are that there will soon be a rock-crushing plant in full operation. It will then be possible to macadamize many miles of road at very little expense.

An inexhaustible supply of water for sprinkling purposes may be had by gravitation from the numerous streams at a nominal expense. Only a few miles have been sprinkled, but the results have been most satisfactory.

A systematic reduction of some of the mountain grades would assist materially in reducing the cost of transportation.

No particular attention has been paid to drainage, and many of the roads located on ridges are badly worn and form ditches to drain the immense watershed.

Some large and expensive bridges have been erected; there is approximately the sum of $70,000 invested in their construction.

There are some toll roads left, the construction of which has cost a great deal of money, and while they have not been built on the easiest lines available, they are in fair condition.

The average annual rainfall for the central portion of the county is 50 inches; western extremity, about 25 inches.

ORANGE COUNTY.

Organized: 1889.

Area: 780 square miles.

Visited: January 20, 1896, by Commissioners Manson and Irvine; August 26, 1896, by Commissioner Maude.

Mileage: No accurate data obtainable.

Improved: No miles macadamized; about 6 miles graveled; 5¼ miles sprinkled; very few miles graded properly.

Title and Records: Titles to roads laid out since organization of county are comparatively regular. Title is obtained by petition, appointment of viewers, viewers' report, etc., as prescribed by law, except where proposed road runs along section lines, in which case these proceedings are dispensed with, and mere declaration made. Abstract of road matters appearing in minute book of Board of Supervisors is kept, and properly indexed.

Manner of Construction and Maintenance: By day's labor and contract, the latter system being used on large pieces of grading, etc., and for digging, hauling, and distribution of gravel.

Accounts: No segregated accounts kept.

Raising Money: By direct taxation on all outside property, road poll tax, and, in year 1895, special levy of 2 cents on each $100 of total assessed valuation.

Amount Expended in Past Seven Years.

Year.	Rate in Cents per $100.	Amount.
1895	28	$22,949 00
1894	25	21,082 45
1893	30	21,796 80
1892	30	22,614 50
1891	25	18,123 14
1890	25	17,548 54
1889	20	15,330 63
Total		$139,447 07

Five sevenths of the county is level valley land, the remainder being composed of mountains and foothills. In the northern portion, which comprises the more settled districts, water for sprinkling purposes is readily accessible, there being many miles of irrigation ditches and hundreds of flowing artesian wells. This artesian belt does not, however, extend to the southern part of the county, where water has to be developed by pumping.

An excellent quality of gravel for road work is obtainable in many districts of the county. Asphaltum beds exist near Anaheim, the product of which could be utilized if properly mixed with sand.

The annual rainfall is about 15 inches.

The matters of road construction and maintenance present but few obstacles in this county. The gravel and water supplies, above referred to, if judiciously utilized, as well as the nature of the soil, form the basis for good roads. The road through the cañon of the Santa Ana River, connecting the counties of Orange and Riverside, though heavily traveled, is, in most localities, on a very poor cross-section, is badly drained, and, therefore, subject to heavy washouts during the winter rains.

Particular attention is paid by the present Board of Supervisors to the asphalting of the floors of bridges, and much good is being accomplished in this direction, though the location of many of the bridges in the county has been anything but economical.

PLACER COUNTY.

Organized: 1851.

Area: 1,484 square miles.

Visited: October 28, 1895, by Commissioners Manson and Irvine; September 15, 1896, by Commissioner Irvine.

Mileage: Approximately, 750.

Improved: No miles macadamized; about 10 miles graveled; by subscription, 8 miles sprinkled.

Title and Records: To the greater portion of the roads, title is very imperfect; it is secured by condemnation, purchase, and grant. There are practically no records. No road map in existence. During the past few years an effort has been made to record the new roads that have been laid out.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioner.

Accounts: Are kept against twenty-six districts.

Raising Money: By direct tax on all outside property, and by road poll tax. Auditor's books also show transfers from county general fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$32,173 71
1894	34	35,066 05
1893	28	27,707 73
1892	30	34,861 08
1891	32	32,484 14
1890	35	51,534 68
1889	35	36,233 93
1888	34	35,951 66
1887	30	26,400 63
1886	30	21,306 17
Total		$333,719 78

Placer County is very narrow, extending from the plains, at an altitude of 160 feet, to the summit of the Sierras, 7,000 feet above sea-level. It is bounded on the north by Yuba and Nevada, on the west by Sutter, on the south by El Dorado and Sacramento, and on the east by Lake Tahoe. The western part of the county is valley land, the center rolling, while the eastern portion rises rapidly to the summit.

Road-building material, consisting of serpentine, limestone, trap, basalt, and shale, abounds in different sections, while granite and gravel are abundant in all portions of the county.

Water for sprinkling purposes, in unlimited quantities, is available from the various mining and irrigation ditches in the rolling and mountainous sections, and may be developed in the valleys by wells and power for pumping. The only sprinkling done is in one section, and the county is not taxed for that specific purpose, as it is done by subscription entirely. The results are entirely satisfactory, and though the taxpayers have requested the Board of Supervisors to take hold of the matter, so far nothing has been done.

The roads through the valley and low hills are by nature very good, but in the mountains they are constructed on very poor lines. No attention has been paid to drainage, and as a consequence they become almost impassable during the rainy season.

Much unnecessary work was observed on the roads of the county.

There are several bridges in this county, but no reliable data as to their cost were obtainable.

Mining and irrigation ditches cross the roads frequently, and in many instances interfere with travel, and often are not bridged, the water being allowed to run and destroy the roadbed.

Many miles of trails are kept up by the Road Commissioners in the mountains, and are expensive to maintain.

The rainfall varies with the elevation, increasing from 20 inches in the valley to over 60 inches on the summit of the Sierras, much of the latter being precipitated in the form of snow.

PLUMAS COUNTY.

Organized: 1854.

Area: 2,361 square miles.

Visited: December 9, 1895, by Commissioner Manson; August 23, 1896, by Commissioner Irvine.

Mileage: 414.

Improved: Data not obtainable.

Title and Records: Title to the major portion of the mileage is good, being secured by purchase, condemnation, and grant. All surveys, with maps, are recorded, and the system is kept up.

Manner of Construction and Maintenance: By day's labor, under supervision of Deputy Road Commissioner principally.

Accounts: Are kept against each road district, as the supervisoral districts are subdivided.

Raising Money: By direct taxation on all outside property, and by road poll tax. Part of funds carried under highway fund account, and transferred as necessity arises.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$23,153 71
1894	40	18,730 31
1893	40	14,776 88
1892	38	13,906 55
1891	38	14,728 26
1890	35	12,960 23
1889	25	12,288 09
1888	25	11,180 61
1887	30	14,172 18
1886	33	13,582 41
Total		$149,497 23

Plumas County is bounded on the north by Shasta and Lassen, on the east by Lassen, on the south by Sierra, Yuba, and Butte, on the west by Butte and Tehama counties. It is a mountain county, in the heart of the Sierras, and rises to an elevation of 10,577 feet at Lassen Peak. It is traversed by mountain ranges interspersed with cañons, valleys, and high rolling hills.

Road-building material is plentiful in almost every portion of the county. Gravel abounds in all the streams, while trap, basalt, limestone, shales, and serpentine are found in the ranges.

The numerous streams, ditches, lakes, and reservoirs furnish an unlimited supply of water for sprinkling purposes, though none of it has ever been utilized.

The mountain grades could be materially reduced by relocation. One of the most notable examples of a proper survey being made before construction is in this county. A new road has been located, and is in course of construction between the Twenty-Mile House and Quincy, which saves a distance of 5 miles, and does not reach so high an elevation by 273 feet as the old road, while the steepest grade does not exceed 12 inches to the rod. In this old road, that has been in use for at least forty years, and is 5 miles longer than the new, there are many places where the grade is more than 3 feet to the rod. Plumas County can justly boast of one of the best mountain roads in the State. It lies between Quincy and Crescent Mills. It is located on the easiest lines and over a material that makes a good natural road. For a short distance it has been macadamized with waste material from one of the large mines, and is as smooth as any road met with in the travels of the Commissioners.

Bridges span all the principal streams, and some very expensive structures have been erected.

This county, like Sierra, is covered with snow for many months in the year, and the only means of communication is on snowshoes.

The average rainfall is 52 inches, and while the greatest precipitation occurs from October to April, showers are not infrequent during the other months of the year.

RIVERSIDE COUNTY.

Organised: 1893.

Area: 7,008 square miles.

Visited: January 31, 1896, by Commissioners Maude and Irvine; August 24, 1896, by Commissioner Maude.

Mileage: 700.

Improved: No miles macadamized; no miles graveled: no miles sprinkled; 40 miles graded.

Title and Records: The majority of roads are such as were laid out by San Diego and San Bernardino counties, out of which the county was created, and the titles to the roads of those counties have never been duly recorded. No effort has been made to better them, nor secure good titles to roads laid out since organization of the county.

Manner of Construction and Maintenance: Maintenance by day's labor. Contract system successfully used in construction.

Accounts: Are well kept. Complete poll tax list kept.

Raising Money: By direct taxation on outside property, and by poll tax.

Amount Expended in Past Three Years.

Year.	Rate in Cents per $100.	Amount.
1895	18	$22,521 79
1894	17	28,661 17
1893	25	39,133 53
Total		$90,316 49

Like San Bernardino County, Riverside County may be divided into two separate classes, the smaller part of the county comprising the settled portion, the eastern part being so-called desert and arid land, not yet placed under irrigation, and where roads of importance will not be constructed for many years to come.

There are in this county deposits of limestone, porphyry, granite, disintegrated granite, and other materials suitable for road-metaling.

Water is, unfortunately, not available for sprinkling purposes in the larger portion of the county.

The construction of roads in the county embraces proper cross-sectioning and surfacing of the roadway with available road-metal, and, in many instances, the construction of permanent culverts.

The rainfall cannot be considered a serious drawback to road maintenance, amounting, as it does, to but 9 or 10 inches per annum in the settled portion, decreasing to less than 2 inches on the desert.

But little can be said of the conduct of road affairs in Riverside County, owing to the fact that the county has been organized for so short a time. It would, however, seem that a county so lately organized would not have the difficulties to contend with found in older counties. It is to be regretted, however, that no systematic effort seems to have been made in this county, aside from the relocation and construction of what is known as the "Box Springs" road, which, constructed under engineering supervision, is probably one of the best roads in the State.

Many of the roads are of exceedingly faulty location and construction. This is notably the case on the road from South Riverside to Santa Ana, Orange County, where, on account of erosion, caused by faulty cross-section and lack of proper drainage facilities, the line of road has to be changed from year to year in many instances.

SACRAMENTO COUNTY.

Organized: 1850.

Area: 1,007 square miles.

Visited: August 10, 1895, by Commissioners Manson and Irvine; October 12, 1896, by Commissioner Irvine.

Mileage: 1,500, approximately.

Improved: 3 miles macadamized; 50 miles graveled; 70 miles sprinkled; 800 miles graded.

Title and Records: Title to three quarters of the mileage is imperfect, but since 1891 deeds have been obtained and recorded, title being obtained by purchase, condemnation, or grant. Records of roads constructed since 1891 are in good condition, but previous to that date are not in such shape as to be reliable.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioner.

Accounts: Are kept against two districts, as the supervisoral districts are not subdivided.

Raising Money: By direct taxation on all outside property, and by road poll tax and railroad tax. Transfers also made from general fund for bridge construction and maintenance.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$48,023 34
1894	25	44,258 22
1893	25	68,719 63
1892	20	42,636 79
1891	20	34,657 51
1890	20	34,755 48
1889	25	45,067 07
1888	25	44,965 10
1887	20	32,837 44
1886	20	28,859 37
Total		$424,226 65

Sacramento County lies east of the lower portion of the Sacramento River, which forms the west boundary of the county for 70 miles, from which it extends to the foothills of the Sierras. The section of the county next the river is low and marshy, and subject to overflow, and is from 10 to 20 feet above tide; next above this lies an alluvial bench, which rises gently into the foothill region.

The county is well supplied with road-building material. Next to the foothills the soil is gravelly, and deposits of very hard cobbles are available for crushing into macadam.

The alluvial lands are readily drained, and can be supplied with excellent macadam from Folsom.

The county receives a mean rainfall of from 15 to 24 inches. In the lower portions, wells furnish an abundant supply for sprinkling purposes.

The bridge system of the county is extensive and costly. The Sacramento River separates it from an extensive and fertile country to the west, and the American and Cosumnes rivers and smaller streams flow through the county from east to west, necessitating long and costly bridges. The roads approaching these bridges are frequently impassable for weeks during the rainy season, and hence, these costly structures do not always subserve their purpose.

Where the roads have been graded, the grade line generally follows the contour of the country, instead of cutting off slight rises and filling slight depressions so as to put the roadbed on a true grade line. This work has cost as much as if properly done, and can be corrected only by being done over. Wooden culverts prevail, and these are a never ending source of expensive repair and renewal.

SAN BENITO COUNTY.

Organized: 1874.

Area: 1,476 square miles.

Visited: December 5, 1895, by Commissioners Irvine and Maude; July 20, 1896, by Commissioner Maude.

Mileage: Approximately, 600. The mileage has never been ascertained, and as there are no records bearing on the subject, an approximation only can be made.

Improved: No miles macadamized; 20 miles graveled; no miles sprinkled; 200 miles graded.

Title and Records: In nearly all cases title is defective. There are no deeds or records. Title is generally obtained by usage. Of late years a slight effort has been made to obtain deeds. The provisions of the Codes seem generally to be ignored. The minutes of the Board of Supervisors are defective. The road book is improperly kept. Other records do not seem to have been kept or indexed, so as to be available.

Manner of Construction and Maintenance: By day's labor. Contract system seems to have never been tried for either construction or maintenance.

Accounts: Are only kept by means of vouchers, which are so indefinite as to be unintelligible.

Raising Money: By direct taxation, road poll tax, and transfers from general fund to road funds.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	22	$12,135 59
1894	20	11,300 04
1893	20	11,178 00
1892	26	16,261 85
1891	28	17,908 88
1890	26	15,343 77
1889	22	13,856 76
1888	20	12,678 78
1887	20	10,947 24
1886	*	†10,201 00
Total		$131,831 36

*No records showing rate. †$1,201 poll tax; balance approximated.

Topographically, the greater portion of the county is either hilly or mountainous. The more densely settled part is, however, valley land and level.

Gravel of superior quality exists in all localities and in great quantities, being found in the streams and in "pits." Granite is found, but is of a soft nature. Disintegrated granite also occurs, and is a good substitute for gravel. Limestone of a good quality, and suitable for road-metal, is encountered in the major portion of the county. It is particularly abundant in the cienega country. Hard, igneous rocks, suitable for road-metal, also exist in small quantities. In Lone Tree district a shale is found that hardens by exposure to the air, and has good cementing qualities. It has been tried to a slight extent and gave excellent results.

Water for sprinkling can be obtained in nearly all localities in the county. The annual rainfall is 12 inches, from November to April.

The soil conditions of the broken portion of the county are favorable to the construction of dirt roads. In many portions of the valley, owing to the prevalence of adobe soil, this is not the case.

An absolute change in the highway management of this county is necessary. The majority of the roads in the hilly portion should be abandoned, and an entirely new location should be adopted, along proper grades, with due regard to proper drainage by means of culverts and ditches. The valley roads require considerable drainage and surfacing with metal.

Maintenance of the hill and mountain roads depends merely on protection from erosion. The valley roads must be sprinkled. The proper location and construction of culverts is of the utmost importance. Those now in use are generally of a size far greater than necessary, thus largely increasing the cost of road construction. They are often so unskillfully located as to be absolutely useless for the purposes intended, and in most cases are constructed of material so perishable in character as to last but a few years. This can be remedied by the use of vitrified pipe for the smaller culverts, and brick, stone, or concrete arches for the larger ones. The expense of such construction is somewhat greater than is that of wooden culverts; but, being of a permanent nature, and requiring no further expenditures in the way of repairs, the suggested improvements would be far cheaper in the end.

Some years ago sprinkling was tried, with very satisfactory results. Unfortunately, with a change of the administration of the county's affairs, there came a lapse into the old rut; sprinkling was abandoned, upon the plea that it had not been found necessary in early days, and was extravagant; the apparatus for sprinkling was even offered for sale; but, fortunately, public sentiment, which had not been strong enough to compel a continuation of sprinkling, prevented the sale of the sprinkling plant; it stands to-day decaying, a monument to former progressive road management.

The Board of Supervisors of this county seems to ignore the Surveyor and his statutory duties entirely. As a consequence, no data were available from this source—a source from which, in most counties, much information is obtainable.

SAN BERNARDINO COUNTY.

Organized: 1853.

Area: 20,055 square miles.

Visited: Febuary 1, 1896, by Commissioners Maude and Irvine; August 21, 1896, by Commissioner Maude.

Mileage: 800.

Improved: 4 miles macadamized; 2 miles graveled; 6¾ miles sprinkled; 60 miles graded.

Title and Records: Records in very faulty condition. (See further remarks below.) Fairly complete for past ten years only.

Manner of Construction and Maintenance: Generally by day's labor, both for construction and maintenance. Contract system for maintenance has been tried, but has proved very unsatisfactory.

Accounts: In poor condition. Only current year's accounts can be ascertained. No definite segregation of expenditures. Previous to 1888, accounts are especially faulty and very negligently kept.

Raising Money: Direct taxation on outside property. Poll tax for years 1888, 1889, 1890; no poll tax since 1890; previous to 1888, records are in such shape that it is impossible to ascertain whether poll tax was levied.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$24,410 94
1894	15	19,853 46
1893	15	24,428 23
1892	20	46,640 60
1891	30	52,351 04
1890	35	30,000 96
1889	20	44,656 06
1888	25	22,830 05
1887	20	*10,000 00
1886	25	*6,250 00
Total		$281,411 94

*Approximately.

This county, the largest in the State, and one of the wealthiest, in so far as the settled region is concerned, may be said to have its settlements and roads embraced entirely within the extreme southwest portion of the county, embracing about 8% of the total area. The remainder of the county is composed of desert and wild, rugged mountains, abounding in mineral wealth.

The roads of the settled part of the county may be subdivided into two classes, viz., valley and mountain roads, the valley roads traversing the more densely populated portion of the county. The soil conditions of the valley are very favorable to the construction and maintenance of roads. There are available in the county, for surfacing these roads, an excellent quality of limestone, disintegrated granite, and numerous deposits of bowlders of a granitic character, which can be readily crushed into good road-metal. Red clay has been used in the county as a top dressing for roads, and has proved a success.

All of the roads, where possible, should be sprinkled. Water is obtainable in many instances from irrigation systems.

In the case of the mountain roads, the matter of grading and location is of prime importance, maintenance in most instances being limited to the protection of the roads from erosion by winter rains.

Roadside tree-planting upon systematic lines should be encouraged over the valley portions of the county. These trees, in most instances, should be of a deciduous nature.

The rainfall being but slight in the valley portions of this county, drainage is of secondary importance.

The records of this county are in a deplorably faulty condition; there being ascertainable titles to but 125 miles of road. Until the incumbency of the present Board of Supervisors, no really systematic effort seems to have been made at road improvement, although large sums of money have been expended on the highway system.

To the present Board is due the credit of the inception of sprinkling. The cost of this, as ascertained, is $5,000 per annum for 6¾ miles of road, or $740 per mile per annum. This, when compared with less than $100 per mile per annum expended for the same purpose in Santa Cruz County, seems excessive. It is hoped, however, that by longer experience, and a further development of this system, the cost of sprinkling can be greatly reduced.

The use of permanent material in the construction of culverts and small bridges is recommended. The use of asphalt as a flooring for bridges would prove a success in this county.

SAN DIEGO COUNTY.

Organized: 1850.

Area: 8,400 square miles.

Visited: January 25, 1896, by Commissioners Irvine and Maude; August 31, 1896, by Commissioner Maude.

Mileage: 5,000, approximately.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; 40 miles graded.

Title and Records: Are in a generally faulty condition.

Manner of Construction and Maintenance: Contract system for construction; day's labor for maintenance.

Accounts: Are in good condition.

Raising Money: By direct tax on outside property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$28,094 25
1894	35	25,284 71
1893	35	27,419 97
1892	30	31,431 30
1891	40	41,655 77
1890	30	33,733 18
1889	30	27,300 17
1888	32	135,776 08
1887	20	29,459 66
1886	25	13,696 60
Total		$393,851 69

San Diego is the most southerly county in the State, being bounded on the south by Mexico, the Colorado River forming its eastern boundary. The county may be classified into three distinct belts, beginning at the coast, and extending to the eastern confines of the county. These are the coast-line, about 75 miles in length, running back to the hill country, a distance of about 30 miles, composed of low valleys, interspersed with intervening table-lands and hills; the second division includes the mountains, while the third is the so-called desert, which covers about two thirds of the area of the county. In the desert are to be found depressions 250 feet below sea-level, while the mountain elevations reach nearly 11,000 feet above the sea.

In considering the road problem in this county it will be necessary to deal with the two first-mentioned sections alone, for the reason that the settlements on the desert portion are widely separated and of but small importance, and until irrigation makes this portion of the county capable of cultivation, road affairs will be of minor importance.

The first section is what is known as the semi-tropic fruit-growing portion, the home of the horticulturist. In this locality the land holdings are small, rarely exceeding ten acres, and as a consequence a large population is concentrated over a comparatively small area. This district demands first attention in the matter of highway construction. The soil, in most cases, in this region is of a nature exceedingly favorable to road construction, as mud rarely occurs during the winter season, at which period the rainfall in this locality is but 10 inches per annum. The varied character of the soil also forms a basis for good roads, as, by a proper admixture of the heavier adobe soils with the lighter sandy soils, a good road surface may be formed. The great difficulty to be contended with is the heat and dryness of the summer, which cause the roads to become excessively dusty. The best remedy for this is sprinkling, but, unfortunately, it is exceedingly difficult to procure water for sprinkling purposes in many localities, and, even where procurable, it entails a heavy expense to the county. As a consequence, it is suggested that, where possible, the road be surfaced with some non-wearing material, of which the supply is varied and plentiful in the county. Gravel abounds throughout the county, in the beds of streams and on hillsides. Regular deposits of cement gravel, which would make an excellent road-surfacing material, occur at Otay. Granite, both disintegrated and solid, is found in various localities. Limestone, trap, and basalt are available in different places.

A systematic effort should be made at roadside tree-planting. These trees should be of a deciduous nature, in order to shield the roads from the heat of summer, while in winter no obstruction will be offered to the sun's action in drying up excess moisture.

In the mountainous portion of the county the main requisite for road construction is proper location upon easy grades, and maintenance by proper ditching and other means which will prevent the erosion of roads by rain. In this section the rainfall averages 35 inches, and the roads, as a general rule, are fairly well shaded by the natural growth of timber. The region being more of an agricultural and pastoral one, the population is less dense, and the traffic consequently much less.

The mileage of roads in this county seems to the Bureau to be excessive. As nearly as can be ascertained, there are now 5,000 miles of highways within the limits of the county, many of which are of such slight importance that they should be entirely ignored. The result of attempting to maintain such a vast mileage of roads in this county is that no properly improved road exists within the entire county.

Some time since, the County Surveyor was directed by the Board of Supervisors to make a reconnaissance survey of the road system of the county. This was carried on until some 3,600 miles had been measured and approximately located. For some reason this exceedingly useful survey has been ordered discontinued. It is to be hoped that it will ultimately be carried to completion, and such roads as are not absolutely necessary for *real* public convenience be discontinued or abandoned. By so doing a large sum of money will be conserved, which might be utilized upon more important roads.

SAN JOAQUIN COUNTY.

Organized: 1850.

Area: 1,370 square miles.

Visited: July 22, 1896, by Commissioners Manson and Irvine; July 11, 1896, by Commissioner Maude.

Mileage: Approximately, 950 miles. The mileage has never been ascertained by the local authorities, and records are deplorably incomplete.

Improved: No miles macadamized; about 25 miles graveled; 45 miles sprinkled; about 200 miles graded; 11 miles of adobe road sanded.

Title and Records: Probably 80% of the titles defective. Of late, the records have been more carefully kept. There is a road book dating from 1854, which has been irregularly written up. The minutes of the Board of Supervisors are very incomplete previous to 1890. Records are filed in Clerk's office, but are not indexed in such a manner as to be available.

Manner of Construction and Maintenance: By day's labor in almost all instances. The contract system is not found satisfactory for maintenance.

Accounts: No detailed accounts of expenditure are kept; the only record being the vouchers, which are filed with the Clerk.

Raising Money: By direct taxation, and road poll tax. Some few instances of transfers to the road fund from other funds.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	18	$38,033 76
1894	17.5	41,785 03
1893	17.5	47,058 81
1892	18	45,442 31
1891	20	44,576 76
1890	18	50,511 12
1889	18	51,864 18
1888	20	58,206 94
1887	20	46,902 83
1886	10	23,629 34
Total		$448,003 08

The county lies entirely in the great interior California valley. The greater portion of it is level, excepting the foothill region of the Sierra Nevada range, which bounds the county on the east, and the base of the Coast Range on the southwest. Along the Sacramento and San Joaquin rivers, in the northwestern portions of the county, are large stretches of tule lands, all of which, with the exception of those parts protected by levees, are subject to overflow.

There are available deposits of gravel in Mormon and French Camp sloughs. There is an abundance of adobe and sand for puddling purposes in the greater portion of the county. Water is also readily obtainable in the natural waterways and wells. The rainfall averages from 18 to 20 inches yearly, precipitated from November to April.

During the summer months the roads are subjected to great heat, particularly as the county is not naturally timbered; and there has been no systematic effort made at roadside tree-planting. The soil conditions are such that the rainfall renders the roads impassable during the rainy season on account of mud, while the unrestricted action of the sun during the summer months makes the grinding of the roads into dust a certainty. The result is that, though the roads are not so impassable at this time of the year as when in a muddy condition, an unnecessarily heavy charge is laid on transportation.

Two factors enter into the proper construction of a highway system for this county; first, a proper drainage of the roadbed; secondly, the surfacing of the road with some substance other than the natural soil, such as gravel, coarse sand and adobe, or, preferably, macadam. Upon the construction of such a road, the proper method of maintenance, aside from the replacing of displaced or worn-out road metal, is by sprinkling and the planting of roadside trees to conserve the moisture artificially applied. Such trees should be of a deciduous nature, in order that their foliage may shield the road surface from the direct action of the sun, while in the winter the bare limbs offer no obstruction to its play, and permit the rapid evaporation of excess moisture. Another need of the county is the construction of culverts by the use of permanent material, such as stone, pipe, or brick or concrete arches, and in the location of these culverts greater care should be exercised than has been in the past. Many of the existing culverts are larger than necessary; others are so located as to serve no purpose other than that of carrying the water from one side of the road to the other. Provision should also be made for the proper carrying away of the water which now stagnates in the ditches on account of the lack of grade.

The only roads in the county of a permanent character of construction are the former toll roads, which, constructed under corporate direction, were originally of a commendable character, but, having reverted to the county, are rapidly deteriorating.

SAN LUIS OBISPO COUNTY.

Organized: 1850.

Area: 3,500 square miles.

Visited: December 16, 1895, by Commissioners Maude and Irvine: July 27, 1896, by Commissioner Maude.

Mileage: About 1,050.

Improved: 10 miles macadamized; 6 miles graveled; 6 miles sprinkled; 20 miles properly graded.

Title and Records: There has been a systematic effort in this county to rectify titles. The records from 1869 to date have been abstracted by order of the Board of Supervisors. Previous to that date there are no records. Title is now obtained by a strict following of the law and the taking of an absolute deed.

Manner of Construction and Maintenance: By day's labor and contract. Contract for construction has proved very effective.

Accounts: Accounts are kept on county vouchers, which are well itemised and generally intelligible.

Raising Money: By direct taxation, road poll tax, and by license fund, which is transferred *in toto* to unapportioned road fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$45,304 53
1894	25	45,492 42
1893	28	52,322 16
1892	25	52,067 06
1891	25	41,242 11
1890	27	46,662 96
1889	25	44,710 42
1888	35	*47,296 54
1887	35	*38,182 08
1886	28	*23,339 83
Total		$436,630 11

*Years 1886, 1887, and 1888 approximated; records of exact amounts unobtainable.

Topographically, the greater portion of the county is mountainous, but a small section being valley land, and this of a rolling character.

Gravel is generally found throughout the county. Disintegrated granite is available between Cuesta and Santa Margarita. Hard granite is found, running from Moro Rock throughout the county. Trap rock of excellent quality is found in practically the same location. Bituminous rock exists in quantities throughout the county. A red rock, excellent for road-building purposes, is found in Cuesta Pass and adjacent to Port Harford. In short, the county is exceptionally favored with good road-building material, readily accessible.

The methods of preserving records in reference to road matters in this county are particularly worthy of commendation.

Water for sprinkling can be obtained adjacent to San Luis Obispo and in some few other sections of the county.

The average annual rainfall is 21.07 inches.

The general soil and climatic conditions of this county are favorable to road construction and maintenance.

On account of the topographical conditions of the county, previously referred to, the matter of grading is an important element to be considered in road-building.

The mountain grade over Cuesta Pass is particularly noteworthy as being one of the best graded and surfaced roads in the State. Great care and engineering ability have been exercised in its location and grade, and have since been shown in its maintenance. The road from San Luis Obispo to Port Harford is also worthy of commendation, being the first road in the county on which a systematic effort has been made at road-sprinkling.

SAN MATEO COUNTY.

Organized: 1856.

Area: 470 square miles.

Visited: July 12, 1895, by Commissioners Manson and Irvine; September 12, 1896, by Commissioner Maude.

Mileage: 334.

Improved: 68 miles macadamized; 32 miles graveled; 66 miles sprinkled; nearly all graded.

Title and Records: Title to roads rests on prescriptive use in older roads. Titles obtained in the manner prescribed by law, and recorded of late years.

Manner of Construction and Maintenance: Materials are hauled by contract; roads maintained by day's labor. Road-sprinkling well developed around Redwood City, San Mateo, Menlo Park, and other centers.

Accounts: Are not well segregated. No list of road machinery kept.

Raising Money: By property and poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	39.5	$61,114 41
1894	37.7	65,947 27
1893	38.4	62,701 15
1892	34	58,352 97
1891	40	59,732 66
1890	40	55,105 60
1889	27	37,489 73
1888	25	36,757 85
1887	30	34,879 96
1886	34	31,357 47
Total		$496,430 07

San Mateo County lies between the southern arm of San Francisco Bay and the Pacific Ocean, fronting about 30 miles on the bay and about 60 miles on the ocean. The Santa Morena Mountains extend through the entire length of the county and reach an elevation of 2,500 feet. The slopes, spurs, and outliers of this range constitute the greater part of the county. About one sixth of the area next the bay shore is level and lightly rolling land of great value. Most of the land is rolling and timbered. Numerous narrow valleys extend parallel with the Santa Morena. The county is splendidly watered, and affords catchment and storage areas for the greater portion of the water supply of San Francisco.

The streams on the west slope are perennial, and their drainage areas are well timbered. Being exposed to moist, rain-bearing winds, the rainfall is large, reaching 50 inches as a maximum, and rarely falling below 20 inches. On the eastern slope and bay shore the rainfall is less, and averages 20 inches.

Water for sprinkling roads is purchased from the water companies at rates of from 8 to 17½ cents per thousand gallons. In Districts 2 and 3 excellent results are obtained. The wagons sprinkle from 8 to 10 miles per day per wagon.

Road-building materials are obtainable in the large creeks, and volcanic and metamorphic rocks are exposed at numerous localities. A quarry has been opened near Redwood City, and the county owns and operates a jaw-crusher with a capacity of 100 cubic yards per day, at a cost of 25 cents to 30 cents per cubic yard. Distribution of material is done by contract, with good results. West of Belmont an excellent variety of red jasper occurs, which is being utilized. The advantages accruing from good roads are fully realized, and has produced marked effects in the eastern part of the county.

Data regarding mileage of roads could not be obtained.

SANTA BARBARA COUNTY.

Organized: 1850.

Area: 2,450 square miles.

Visited: December 21, 1895, by Commissioners Irvine and Maude; August 1, 1896, by Commissioner Maude.

Mileage: Unknown, probably 1,200.

Improved: No miles macadamized; no miles graveled; about 12 miles sprinkled; 50 miles graded.

Title and Records: Title to old roads exists by usage. The method of obtaining title as prescribed in the Codes is regularly followed. An abstract of all records is kept by the Clerk. The records, so far as they exist, have been filed and indexed in a systematic manner. Titles are in better condition for roads laid out of late years. For these roads deeds have been taken.

Manner of Construction and Maintenance: By day's labor. County prisoners have been worked with good results.

Accounts: Previous to incumbency of present Auditor, accounts were in a deplorable condition and unintelligible. Vouchers are filed with Clerk.

Raising Money: By direct taxation and road poll tax; exact records of the latter levy not, however, obtainable.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$38,026 23
1894	35	54,865 60
1893	40	49,778 78
1892	40	32,821 05
1891	40	41,681 55
1890	40	39,446 60
1889	30	30,000 00
1888	25	30,000 00
1887	30	30,000 00
1886	37	30,000 00
Total		$376,619 81

On account of poor condition of accounts, the figures given for years 1886 to 1889 had to be obtained by approximation.

Situated as it is, entirely within the Coast Range, Santa Barbara County may be classed as mountainous. The exceptions to this are a narrow strip of land skirting the coast and small interior valleys, which are generally of a rolling nature.

There are in the county available deposits of granite, limestone, disintegrated granite, bituminous rock, and asphaltum.

Water is obtainable through the majority of the valleys and on the coast from natural watercourses and by means of wells.

The soil conditions are generally favorable to dirt road construction, the soil in most instances being of a granitic nature, as a consequence of which the rainfall, which averages but 18 inches annually, is not detrimental.

In the proper construction of a highway system for this county, location and grading are the prime factors, as it will readily be seen that the majority of roads in this county are mountainous in character. The location should always be considered from the standpoint of economical maintenance, and not of primarily economic construction. In no instances should these mountain grades exceed 8%, and due attention should be paid to the construction of drain ditches and culverts to prevent the washing of the road away.

Between the first and second trips of inspection made by the Bureau a marked improvement was noticed in the matter of construction and location of culverts. These had previously been very faulty in construction and location.

Through the valley lands roadside trees should be planted where practicable.

Adjacent to some of the cities in the county an extension of sprinkling is recommended.

The Board of Supervisors of this county is to be particularly commended upon the inauguration of a systematic effort which they have made toward the erection of guide-posts and mile-posts, as well as upon the utilization of a complete system of blank forms relating to highways, their condemnation, location, construction, etc., now in use in the county.

County prisoners have been successfully employed upon road work, notably upon the Mission Cañon road. The continued utilization of this labor is recommended.

The successful use of bitumen as a surfacing material, without a concrete foundation, by the City of Santa Barbara, is worthy of mention. It could be successfully employed upon the road from Santa Barbara to Montecito, the temperate and equable climate of this coast strip being especially adapted to its use.

There is one section of particularly faultily graded road about 2 miles from Carpinteria, between that town and Ventura, the grade rising abruptly toward the summit from 8% to about 20%. It is difficult to comprehend why this sudden rise could not have been properly distributed along the road, or, better still, why the road was not located around the hill instead of over it.

SANTA CLARA COUNTY.

Organized: 1850.

Area: 1,356 square miles.

Visited: July 15, 1895, by Commissioners Manson and Irvine; September 18, 1896, by Commissioners Manson and Maude.

Mileage: 775.

Improved: 3 miles macadamized at private expense; 400 miles graveled; 270 miles sprinkled; 775 miles graded.

Title and Records: Titles to roads rest on occupancy and use for early roads, and upon deeds and maps filed in office of the Board. These records are quite voluminous, and are in bad shape for preservation.

Manner of Construction and Maintenance: Road construction and delivery of gravel generally by contract. Maintenance by day's labor.

Accounts: Are in excellent condition; kept by road districts.

Raising Money: By property tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$103,633 59
1894	30	108,243 19
1893	30	105,398 63
1892	30	104,976 45
1891	30	100,613 97
1890	30	97,678 03
1889	30	100,635 67
1888	25	84,806 09
1887	30	79,532 93
1886	30	74,869 07
Total		$980,376 62

Santa Clara County lies at the head and on either side of the southern arm of the Bay of San Francisco, and extends from the crest of the Coast Range to the crest of the Santa Cruz Mountains. About one fifth of the entire area of the county is nearly level; the remainder is rolling and mountainous, the higher peaks rising to elevations of 4,200 feet in the Coast Range and 3,800 feet in the Santa Cruz Mountains.

The county is fairly well watered; some of the streams from both sides of the valley are perennial; artesian water is found over a large area near Santa Clara. The rainfall is dependent upon altitude and exposure, ranging between 50 inches in the exposed peaks and 12 to 15 inches in the drier portions of the valleys.

Water for road-sprinkling is developed to a sufficient extent to sprinkle about 270 miles of road—about half the mileage that is sprinkled in the rest of the State.

Road-building materials occur in numerous localities. Gravel of a fair quality is abundant in the streams from both ranges, and is largely utilized. Supplies for repairing during the wet season are hauled during the dry months and stored at convenient localities. Volcanic and metamorphic rocks occur in the foothills of the Santa Cruz (Santa Morena) Mountains, and variously colored jasper occurs in the Coast Range. An extensive bed of asphaltum exists at Sargent's Station, in the southern end of the county. These materials have been utilized in the construction and maintenance of more than one half of the mileage of roads in the county, and the results of this work are apparent in the high value of lands.

Conditions for good roads are favorable, and the county officials have recognized and made use of these conditions to a greater extent than in other portions of the State.

The economy of permanent bridges is beginning to be recognized, and some of the smaller streams are spanned by concrete and masonry bridges.

SANTA CRUZ COUNTY.

Organized: 1850.

Area: 425 square miles.

Visited: December 7, 1895, by Commissioners Irvine and Maude; September 15, 1896, by Commissioner Maude.

Mileage: About 400 miles.

Improved: 1½ miles macadamized; 10 or 15 miles graveled; 97 miles sprinkled; nearly all well graded.

Title and Records: Probably 80% of the titles are defective. In the past few years an effort has been made to rectify the defective titles. The method of obtaining title is, in general, the method prescribed in the Codes, through the appointment of viewers, condemnation, etc. The records existing are carefully preserved, and are indexed, but an improvement in the system of indexing should be made. A road book is kept, but in poor shape.

Manner of Construction and Maintenance: Day's labor and contract have both been tried successfully in the county.

Accounts: No accounts are kept, other than the county vouchers, which are carefully itemized.

Raising Money: Money is raised by direct taxation, poll tax, and transfers from the county fund to the various district funds.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$30,853 90
1894	40	30,886 54
1893	35	29,009 58
1892	40	31,213 12
1891	40	30,235 12
1890	40	30,104 16
1889	40	30,553 70
1888	25	22,153 67
1887	28	20,102 56
1886	33	22,671 18
Total		$277,783 53

Santa Cruz County lies around the northern half of the Bay of Monterey, having a coast-line of some 40 miles upon this bay and the adjacent ocean to the north. It rises from tide level to the summits of the Santa Cruz and Santa Morena Mountains, reaching altitudes of between 2,000 and 4,000 feet. That portion of the county in the extreme southern part bordering Monterey County, in the valley of the Pajaro River, and a portion of the coast and plain, are level or slightly rolling, the remainder being rolling and mountainous.

The entire county is well watered, the rainfall varying between 20 and 50 inches. The greater portion of the rolling and mountainous land is well timbered, and perennial streams flow from both ranges of mountains. The water supply for road-sprinkling has been developed sufficiently to sprinkle daily nearly 100 miles of road, and the largest and most efficient sprinkler in the State was built between the first and second visits of the Commissioners.

Road-building materials exist in abundance and great variety, bituminous rock from this county being transported to distant points for street-paving and suburban road-building. Volcanic and metamorphic rocks afford material for macadam, and all the larger creeks yield excellent gravel, which, if screened, makes good road-surfacing material.

Permanent road construction has been commenced in the county, and the Board of Supervisors has located and permanently constructed many miles of well-graded, well-drained roadway, which work has appreciated the value of adjoining property and served as a stimulus to further road construction.

Permanent structures have been built in the place of many temporary culverts and bridges. Road-building throughout the county is in a more advanced and better state than in the majority of counties throughout the State.

SHASTA COUNTY.

Organized: 1850.

Area: 4,050 square miles.

Visited: November 6, 1895, by Commissioners Manson and Irvine; July 13, 1896, by Commissioner Irvine.

Mileage: 1,500.

Improved: No miles macadamized; 25 miles graveled; no miles sprinkled; 410 miles graded.

Title and Records: Title is very imperfect, though for all new roads they endeavor to get deeds to rights of way. Title is secured by purchase, condemnation, and grant. Records are not in good condition, as only a very small percentage of roads is recorded.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioner and District Roadmasters.

Accounts: Are kept in good condition against five road districts, as supervisoral districts are not subdivided.

Raising Money: By direct tax on all outside property and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$21,844 72
1894	25	19,011 95
1893	25	18,148 44
1892	25	17,540 59
1891	30	20,107 02
1890	30	15,875 45
1889	35	14,400 40
1888	22	13,862 77
1887	31	12,682 08
1886	26	11,910 00
Total		$165,383 42

Shasta County is divided by the Sacramento River, three fourths being on the east side and the remainder on the west side. It lies north of Tehama, and extends from the crest of the Coast Range, 7,776 feet above tidewater, on the west, to the Black Buttes on the east. The surface is extremely mountainous, only a very small portion being rolling valley land.

Gravel for road purposes is plentiful in portions of the county, while granite, trap, and basalt abound in the northern part.

Water for sprinkling may be obtained by boring wells and pumping in the rolling valley lands, and can be readily secured in almost any part by gravitation from the numerous mining ditches throughout the county.

Toll-roads traverse the county, and are a great tax on the traveling community, though the Board of Supervisors is abolishing the toll-roads as rapidly as their franchises expire.

Such mountain grades as are public roads are poorly located and expensive to maintain, and must be run on better lines before this county will reap the benefits to be derived from a thorough road system.

There has been a marked improvement in the road system since the first visit of the Commissioners, notably in the construction of culverts and small bridges, vitrified pipe being used entirely in place of wood.

Bills for road work are properly itemized, not only showing the district in which the work was done, but showing the road and specifying the location and character of the work done.

Many good bridges have been constructed, notably the one across the Sacramento River near Redding. There is invested in these structures, approximately, $140,000, and many of them are in good condition.

The rainfall is enormous at times, and great damage is done to roads and bridges. The average rainfall is variable in various locations. At Reed's Camp, in the valley of the Upper Sacramento, it reaches 70 inches, or more, annually, while in the southern part of the county, the average is 35 inches, increasing as a higher elevation and more northerly location is reached.

SIERRA COUNTY.

Organized: 1852.

Area: 910 square miles.

Visited: December 5, 1895, by Commissioner Manson; August 21, 1896, by Commissioner Irvine.

Mileage: 500, approximately.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; 200 miles graded.

Title and Records: Title to nine tenths of the roads is very imperfect. It is secured by declaration, purchase, and grant. Records are in very poor condition; in fact, nothing is available.

Manner of Construction and Maintenance: Day's labor, under supervision of Road Commissioner.

Accounts: Are kept against five districts.

Raising Money: By direct tax on all property and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$7,071 72
1894	40	7,854 36
1893	41	8,357 52
1892	41	8,380 00
1891	43	8,296 90
1890	43	9,079 23
1889	38	8,703 79
1888	38	9,068 06
1887	33	8,944 15
1886	35	6,294 00
Total		$82,109 73

Sierra County is bounded on the north by Plumas, on the south by Nevada, on the west by Yuba County, and on the east by the State of Nevada. It is extremely mountainous and rugged, with many small valleys lying up among the highest peaks. Sierra Valley, 5,000 feet above sea-level, is the largest area of level land, containing nearly 250 square miles.

Road material of almost every variety is plentiful. Gravel, granite, trap, basalt, and serpentine occur in different parts of the county, though very little has ever been utilized.

Water for sprinkling purposes in an unlimited supply may be developed along all the roads with very little expense. Numerous streams, ditches, and lakes abound throughout the county.

The Surveyor who was last elected never qualified; consequently, this county is without one of its most important officers, so far as road construction is concerned. Much necessary data was therefore unobtainable, as none of the other officials were posted.

Toll roads are numerous, and some of them are exceedingly well located, but they are narrow and in poor condition in a number of places. Tolls are collected, irrespective of the fact that franchises may have expired.

No attention is paid to roads if they interfere with a mining claim, and the answer received to the question as to methods of changing or altering roads was, "They turn a monitor on and blow them to pieces." Such is the case, as was ascertained by traveling over some almost impassable places where the road had been changed in this manner.

There are neither road maps nor records of any description showing the location of any of the roads.

There is one exceedingly good grade, from Downieville to Sierra City, that is well located, and, with more attention as to drainage, would be as good as many mountain grades. Many miles of trails are maintained, and are well located.

Snow covers the roads for weeks at a time, and the only means of communication is on snowshoes. The greatest amount of rain falls in the more elevated northwestern portion of the county, reaching 70 and 80 inches annually, snow falling to a depth of 20 feet; while, in the eastern part of the county, the annual rainfall diminishes, reaching its minimum of about 16 inches toward the Nevada border line.

SISKIYOU COUNTY.

Organized: 1852.

Area: 6,078 square miles.

Visited: February 3, 1896, by Commissioner Manson; August 8, 1896, by Commissioner Irvine.

Mileage: 2,500.

Improved: No miles macadamized; 5 miles graveled; no miles sprinkled; 1,500 miles graded.

Title and Records: Title to at least 60% of all the county roads has not been obtained, and the roads have become the property of the county by sufferance. Title is acquired by purchase, condemnation, and grant. Records are in such condition that very little reliable data could be obtained for the older roads. Of late years, the road register is well kept, and all roads duly recorded.

Manner of Construction and Maintenance: By day's labor principally, though there are some contracts let under provisions of Section 2646 of the Political Code; but results are far from satisfactory.

Accounts: The supervisoral districts are not subdivided, and the accounts are kept in each supervisoral district.

Raising Money: By direct tax and road poll tax. Bridge bonds amounting to $30,000 issued in 1890.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$27,918 89
1894	25	25,496 64
1893	20	20,153 39
1892	21.6	24,319 36
1891	20.4	22,837 16
1890	17	46,174 48
1889	13	15,096 77
1888	15.6	16,877 11
1887	15	11,123 26
1886	17	11,637 76
Total		$221,632 82

Siskiyou County extends from Trinity on the south to the Oregon State line on the north. The Coast Range and Sierra Nevada Mountains meet in this county, and form an extremely rugged surface. About one sixth of its area is rolling and valley land, while the remainder is extremely mountainous, Mount Shasta reaching an altitude of 14,350 feet, standing at the head of the great California valley in this county. In the northeastern portion are extensive lava beds. Siskiyou forms a part of a high plateau, with an elevation of from 3,500 to 4,000 feet, extending into Modoc and Lassen counties, and surrounded by volcanic mountains.

Road-building material is plentiful in all parts of the county. Gravel is found in all the streams and in the valleys, while trap, basalt, limestone, and quartzite are found throughout the plateau and mountains.

The numerous mountain streams and mining ditches furnish an unlimited supply of water by gravitation, while in the valleys water for road-sprinkling can be developed from wells and by pumping.

The soil in many sections is of a fine gravelly formation, and the roads constructed in these sections are extremely good, and easy to maintain. In fact, many miles of such road have never had one dollar expended upon them for maintenance or construction, the only expense necessitated being that for the construction of the culverts and small bridges across the waterways. The mountain grades are steep and poorly located, though some of the toll roads upon which the franchises have expired are constructed on easy grades.

Stock in the mountains cause great damage to the grades every year. In grazing over the mountains they cause the rocks and earth to be loosened and precipitated on the roadbed. The expense of repairing the road from this cause alone is very heavy.

Very little attention has been paid to drainage, and the snows and excessive rainfall, together with the irrigation ditches, cause many portions of the road to be annually washed away.

The great number of rivers and streams has required the construction of many bridges, which, in addition to the cost of necessary maintenance, has been a great expense to the county. The bridges, for which an issue of bonds was made in 1890, in addition to moneys taken from the general fund, are valued at $60,000, though in reality they cost double that amount. This county has been unfortunate in its experience with bridges, for most of the bridges were faultily constructed, and, as a consequence, more money has been expended in repairing old bridges than would have been required to build new ones. In many instances the bridges have had to be entirely rebuilt in a short time after their construction.

Average rainfall, 33 inches. Heavy snows fall in the mountains and much in the valleys.

SOLANO COUNTY.

Organized: 1850.

Area: 911 square miles.

Visited: June 27, 1895, by Commissioners Manson, Irvine, and Maude; September 4, 1896, by Commissioner Irvine.

Mileage: 600.

Improved: 1 mile macadamized; 100 miles graveled; 30 miles sprinkled; 500 miles graded.

Title and Records: Title to about one half of the roads is good, balance being defective. It is secured by purchase, condemnation, and grant. Records are in good condition, the roads being mapped and filed.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioners and district overseers.

Accounts: Are kept against thirteen road districts.

Raising Money: By direct taxation on all outside property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$47,610 45
1894	30	45,299 44
1893	25	40,863 26
1892	25	40,540 28
1891	30	47,854 46
1890	25	42,236 80
1889	22	38,296 02
1888	23	46,941 60
1887	20	35,417 48
1886	19	31,919 24
Total		$414,979 03

Solano County is bounded on the north by Yolo, on the east by Sacramento, on the west by Napa, and extends south as far as the Straits of Carquinez. The crest of the Vaca Mountains, rising to a height of 2,000 feet, forms the boundary line between Solano and Napa counties. Of its area, about 160 square miles are swamp and overflowed lands; the remainder is valley and rolling land.

The supply of road-building material is limited, though in the foothills large quantities of basalt are encountered. Gravel is found in deposits and in some of the streams. It is most plentiful in Putah Creek, which is the dividing line between Solano and Yolo.

Water for sprinkling purposes is obtained from wells, windmills furnishing the power for a portion of the supply, though in one district a portable gas engine is used, and has been found to be very economical. Beneficial results are obtained from the roads thus treated, and the system is being extended from year to year.

Roads follow the section lines generally, and in the rolling hills many steep grades could be obviated by abandoning the present location and relocating on easier grades. Many miles have been graded and graveled, and much improvement is noticed since the first visit of the members of the Bureau. This is notably in the cross-section of the roadbeds and drainage. In one supervisoral district many improvements, in the way of concrete and stone culverts, have been made this year at the suggestion of the Bureau of Highways.

There are not many expensive bridges in this county, but culverts and small bridges are numerous. In the swamp and overflowed portions some very long stretches of trestle must be maintained, as it is the only method of communication for the public.

The rainfall varies greatly according to locality; approximate annual precipitation being, Benicia, 15 inches; Vallejo, 15 inches; Suisun, 20 inches; Vacaville, 30 inches.

SONOMA COUNTY.

Organized: 1850.

Area: 1,540 square miles.

Visited: July 1, 1895, by Commissioners Manson, Irvine, and Maude; August 31, 1896, by Commissioner Irvine.

Mileage: 1,200.

Improved: No miles macadamized; 100 miles graveled; 12 miles sprinkled; 1,000 miles graded.

Title and Records: The Clerk of the Board of Supervisors reports that complete deeds to all the rights of way are recorded in the Recorder's office. Title is obtained by consent, condemnation, and purchase. Records are complete, showing all the roads, and the accounts are correctly kept by the Clerk of the Board of Supervisors.

Manner of Construction and Maintenance: By day's labor, under the personal supervision of the Road Commissioner.

Accounts: Kept in the several road districts, the supervisoral districts being subdivided.

Raising Money: By direct taxation on all outside property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	22	$50,817 85
1894	20	51,252 81
1893	17	47,306 75
1892	18	50,870 23
1891	20	51,449 62
1890	18	46,798 41
1889	20	53,561 23
1888	20	52,292 78
1887	20	48,841 66
1886	18	36,474 17
Total		$489,665 56

Sonoma County joins Mendocino on the north, and extends as far south as San Pablo Bay. The eastern boundary is the crest of the main Coast Range, and rises to a height of 4,329 feet at Mount St. Helena. Low valley and bottom lands comprise the remainder of the area of this county, ranging from rolling to mountainous.

Road-building material abounds in almost every portion of the county. Basalt in unlimited quantities is found in the eastern part of the county, while trap and serpentine abound through the western portion.

Small streams are numerous in all parts of the county, from the beds of which gravel of a good quality is obtained. Russian River furnishes an unlimited supply of gravel, and some of the main lines of road are in close proximity to it. Many miles have been well graveled, but in many cases must be regraveled, as the roadbeds were not properly located. Not much attention has been paid to drainage or location. A portion of the mountains is of volcanic formation and subject to slides, and, as a consequence, the maintenance of the roads is difficult and expensive.

Bridges are numerous, and some very expensive structures span the various streams, notably the one across Sulphur Creek near the Geysers. This bridge was constructed several years ago, at an approximate cost of $7,000 or $8,000, yet the road has never been built to or from it, and there it stands as a monument to some one's blunder.

The sprinkling of roads has not been so universal as it should have been, for water is abundant both from the numerous streams and from wells. However, the people realize the comforts and economy of the work done in this line, and the Board of Supervisors is gradually extending the system from year to year. The roads in the valley lands need the judicious application of water to make them as good as any in the State; yet, from lack of this practice, many miles are in a deplorable condition.

The mountain roads are similar to those of all mountain counties, being located on lines that offer the greatest resistance, and are most expensive to maintain.

STANISLAUS COUNTY

Organized: 1854.

Area: 1,486 square miles.

Visited: September 2, 1895, by Commissioners Manson and Irvine; July 15, 1896, by Commissioner Maude.

Mileage: 450.

Improved: No miles macadamized; about 12 miles graveled; no miles sprinkled; no miles properly graded.

Title and Records: Titles are defective in almost all instances. No records seem to have been kept by which the county could prove titles to rights of way, even by usage. The method of obtaining title seems, in most instances, to be a simple declaration that a road is a county highway. If there ever were records, they have either been lost or destroyed. There are but few to be found, and they are not so carefully preserved or indexed as to be available.

Manner of Construction and Maintenance: By day's labor.

Accounts: No accounts kept other than the ordinary voucher, which is rarely itemized so as to be intelligible.

Raising Money: By direct taxation only. No poll tax collected since 1893; records not obtainable of poll tax collected previous to 1889. Bonds issued in 1880, of which $14,500 is now outstanding.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	20	$31,282 43
1894	20	28,570 13
1893	20	30,750 54
1892	17	27,768 75
1891	20	31,205 05
1890	20	30,333 65
1889	12	19,584 77
1888	11	15,476 91
1887	11	14,813 37
1886	13	18,400 75
Total		$248,184 35

The major portion of the county, containing the greater part of the population, is situated in the great valley of California, and is level; the smaller, unsettled, western portion is of a mountainous nature, rising to the crest of the Coast Range.

The county is traversed by a number of streams, most of which supply an abundance of gravel of a superior quality, all of which is available for road purposes. Granite is also found, but is not so good a material for road-metaling, and, on account of location, is not so available. Hardpan is available in most localities, as is also sand, both of which, judiciously used, will serve for road-surfacing.

Water for sprinkling can be obtained in almost every locality of the county, from natural waterways and from wells. The rainfall averages 16 inches a year, and is precipitated during the months of November, December, January, February, March, and April.

The valley portion of the county is subjected to great heat during the summer months, and as no natural timber exists, and no systematic effort at roadside tree-planting has been made, the roads are cut into dust in summer.

The general soil conditions are such that good dirt roads can be maintained.

To construct highways properly in this county it is essential to give the roads proper cross-section and surface the road with metal, which has been mentioned as available. Proper maintenance, other than the replacing of worn-out metal, can only be effected by sprinkling, and can be rendered more economical by a systematic effort at roadside tree-planting. The trees planted should be of a deciduous nature, in order that during the summer months the foliage may shield the road surface from the direct rays of the sun, while in the winter, there being no leaves, the sun has full play, and relieves the road of all excess moisture by evaporation.

The temporary character, improper location, and often excessive size of culverts, is another source of expense which should be remedied.

Although abundant road-metal and water exist, there has been no effort made at permanent construction.

It is the custom to cover the roads in the summer season with refuse straw, which is abundant. This is the most temporary makeshift. The cost of this strawing varies from $30 to $45 per mile, and in many instances must be repeated two or three times a season. Nor is this all. It frequently happens that a lighted match or cigar is dropped on a freshly strawed road, and the whole roadway vanishes in smoke. It is a well-authenticated fact that, on one occasion, on the day after a road had been strawed, a band of hungry cattle came along and actually ate the road up.

SUTTER COUNTY.

Organized: 1850.

Area: 611 square miles.

Visited: October 30, 1895, by Commissioners Irvine and Manson; October 3, 1896, by Commissioner Irvine.

Mileage: 330.

Improved: No miles macadamized; no miles graveled; 2 miles sprinkled; 150 miles graded.

Title and Records: To three fourths of the mileage, title is very imperfect. Of late, however, an endeavor has been made to get deeds. Title is obtained by purchase and grant. Records are in such condition that no reliable data could be obtained.

Manner of Construction and Maintenance: By day's labor of ten hours, under personal supervision of Road Commissioner.

Accounts: Are kept against the five road districts of the county.

Raising Money: By direct taxation and road poll tax. Road bonds amounting to $11,000, to run twenty years, bearing 6%, were issued in 1883. No provision made for redemption.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	9	$7,316 23
1894	8	7,876 63
1893	7	8,422 77
1892	1.25	1,959 00
1891	4	4,758 69
1890	4	4,715 43
1889	3.3	6,573 07
1888	3.5	4,575 84
1887	4	4,335 82
1886	3	4,053 97
Total		$54,567 44

NOTE.—Additional levy is made for bridge purposes.

Sutter County is bounded on the north by Butte, on the east by Placer and Yuba, on the south by Sacramento, and on the west by Colusa and Yolo. This small and fertile county has the Sacramento River for its eastern boundary, and is the only one in the State which lies wholly in the great valley. With the exception of the Marysville

Buttes, which rise to the height of 1,800 feet, the whole area of the county is one great plain. About 200 square miles are tule and overflowed lands.

Road-building material is scarce, though some gravel is to be found in the beds of the rivers. Sand is abundant.

Water for sprinkling purposes can be developed throughout the whole county by wells and power for pumping.

The soil through a great portion of the county is of adobe formation, but some very good roads have been constructed by proper grading and drainage and surfacing with sand. They become badly cut during the autumn months, but by a judicious application of water during the summer months this could be obviated. In 1883 there were issued bonds to the extent of $11,000 for road purposes, but no provision has been made for the redemption of same, though they mature in 1903.

The tax levy for road purposes is very small, but in addition thereto, a special levy for bridge purposes is made. Bridges are a source of great expense, and many structures have been rendered useless during the winter months owing to the fact that the extreme high water washes away the approaches thereto.

In the northern portion of the county the soil is of such a nature that the roads are naturally good and need only sprinkling to maintain them in good condition. Much of the road work in this county has been done by subscription of funds and labor, and the character of the roads so constructed is equal to any in the county. Section lines are followed in laying out the roads, thus increasing the mileage and cost of construction and maintenance.

The average rainfall is 19 inches, from October to April.

TEHAMA COUNTY.

Organized: 1856.

Area: 3,200 square miles.

Visited: November 4, 1895, by Commissioners Irvine and Manson; July 11, 1896, by Commissioner Irvine.

Mileage: 620.

Improved: 1 mile macadamized; 44½ miles graveled; none sprinkled; 283 miles graded.

Title and Records: Title is good to only about one third of the mileage, the remainder being used by sufferance. Title is obtained by purchase and grant, and, in many instances, by order of the Board of Supervisors. At present the records are in excellent condition, with a double index for name and number of all roads. Of late years all roads are mapped, but no bridges are marked on map.

Manner of Construction and Maintenance: By day's labor, under supervision of Road Commissioner.

Accounts: Are kept against five districts only, as the supervisoral districts are not subdivided. (See further remarks below.)

Raising Money: By direct tax, road poll tax, and donation. The books also show numerous transfers from other funds to road fund.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	25	$21,453 90
1894	22	10,963 04
1893	23.4	27,328 50
1892	17	21,416 64
1891	17	31,960 25
1890	15	25,317 29
1889	16	26,781 33
1888	11	24,103 01
1887	11	19,605 98
1886	25	22,800 20
Total		$238,770 13

Tehama County lies on both sides of the Sacramento River, at the head of the Sacramento Valley, and is almost equally divided by that stream. It extends from the crest of the Coast Range on the west, at an elevation of about 8,000 feet, to the Lassen Buttes on the east, which are 10,437 feet above tidewater. About one sixth of the total area is valley and bottom land, the remainder being rolling and mountainous.

Gravel abounds in all streams on the west side of the Sacramento River, while trap is plentiful in the eastern portion of the county.

Water for sprinkling purposes is plentiful, both by pumping from wells and by gravitation, as the county is well supplied with mining and irrigation ditches and many natural streams.

The great lava plain of the northwest covers a portion of this county, and one of the most important roads traverses this plain for a distance of 12 miles. It was in connection with this road that the services of the Bureau were first called upon, and the advice given and suggestions made were followed, with gratifying results. The people of that section demonstrated that it does not take money alone to build roads, for they subscribed a thousand days' labor for themselves and teams, and, with a rock-crusher purchased by an interested party, they are building a first-class macadamized road at a minimum cost.

An excellent method has been adopted in this county, whereby all the roads have been named and numbered, and a double index for same has been made. Accounts are kept against the roads separately, showing the cost and character of the work done. This method is due to the efficiency of the County Surveyor, and the gratifying results obtained more than compensate for the small outlay.

Bridges are numerous and expensive, and there is invested in bridges at the present time $202,060; the bridge over the Sacramento River at Red Bluff, consisting of five 150-foot spans, cost $44,400.

We are pleased to note since the first visit of the Commissioners to this county that as fast as the wooden culverts need any repairs they are replaced with vitrified pipe.

A well-located road is in course of construction, from Red Bluff to the county line, which will reduce the grade more than 50%.

The average rainfall in the county is 30 inches per season, from October to April.

TRINITY COUNTY.

Organized: 1851.

Area: 3,276 square miles.

Visited: November 8, 1895, by Commissioner Manson; July 16, 1896, by Commissioner Irvine.

Mileage: 624—178 miles of road and 446 miles of trails.

Improved: No miles macadamized; no miles graveled; no miles sprinkled; 178 miles graded.

Title and Records: Title to the greater portion is defective. It is obtained principally by dedication to the public, when petitioned for by the people. Records are in such condition that no reliable data could be obtained.

Manner of Construction and Maintenance: Entirely by day's labor.

Accounts: Are very well kept in five funds and a general fund. All claims correctly itemized, showing where the work was performed and its character.

Raising Money: By tax on outside property and by road poll tax. $14,000 bridge bonds to run twenty years, bearing 5%, were issued in 1889.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	15	$4,396 95
1894	20	4,756 64
1893	20	4,364 15
1892	30	5,874 75
1891	33	6,365 44
1890	35	5,733 00
1889	10	16,949 30
1888	10	2,840 62
1887	10	3,149 90
1886	10	3,012 72
Total		$57,440 47

Trinity County lies north of Tehama and Mendocino counties, the northern boundary being the crest of the New River, Salmon, and Scott mountains, reaching an elevation of 9,373 feet at Thompson Peak. The whole county is extremely mountainous and rolling, with a very small percentage of small valleys adapted to agriculture and grazing.

Road-building material of almost every description abounds in different portions of the county, but very little has been used. Water for sprinkling purposes could be had by gravitation, as the mountains are well supplied with streams, and mining ditches are to be met with in almost every section.

This county has more mileage of toll roads than of county roads; and the former are all well located on easy grades, while the county roads are very poorly located, and, owing to excessive rains, are impassable at certain seasons of the year. The average rainfall is from 40 to 50 inches; snow lies on much of the surface for months at a time.

TULARE COUNTY.

Organized: 1852.

Area: 4,935 square miles.

Visited: February 15, 1896, by Commissioners Maude and Irvine; July 18, 1896, by Commissioner Manson.

Mileage: 2,185.

Improved: No miles macadamized; no miles graveled, except mileage in gravelly soil; no miles sprinkled; 1,737 miles graded.

Title and Records: Titles rest upon a better basis than in most counties, as the records are in better condition. Deeds are of record since 1883. Older roads rest upon survey notes and occupancy. Where changes have been made in location, title by occupancy must be proved. The records consist of (1) Four volumes of road minute books; (2) road register of usual form; (3) road plat book, on scale of 40 chains to one inch. In this, owing to irregularities in record, some roads are platted a mile or more from where they exist. (See T. 20 S., R. 19 E.)

Manner of Construction and Maintenance: Mostly by day's labor. Contract system in favor on small mountain roads.

Accounts: Fairly well kept, but not definite enough. Warrants sometimes indorsed in favor of and collected by Road Commissioner.

Raising Money: By property and poll tax. In 1878, sixty-two $500 bonds issued; term, ten to twenty years; interest, 7%; sold at about 50 cents on the dollar; last installment of redemption and interest paid up in fiscal year ending June 30, 1896.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	30	$43,070 01
1894	25	68,592 73
1893	35	70,520 52
1892	27	64,761 27
1891	27.4	49,979 84
1890	21	47,414 00
1889	20	42,521 01
1888	15	37,588 96
1887	25	31,718 43
1886	30	34,440 13
Total		$490,601 89

Tulare County extends from the center of the great valley, near Tulare Lake, eastward to the crest of the Sierra Nevada at its culminating peaks about Mount Whitney. Differences in elevation, therefore, reach their maximum in this and Inyo, the next adjoining county east. The westerly third of the county lies within the valley of California, the remainder upon the west slopes of the Sierra, and is rugged and broken.

Kaweah, Kern, and Tule rivers drain the county; the headwaters of the two former are in the perpetual snow of the highest peaks of the Sierra, and the latter occupies a lower and more westerly basin.

The average rainfall is about 10 inches in the lower, and double to treble this amount in the more elevated portions. Summer rains are practically unknown in the lower, and common in the upper part of the county. Water is made available in the valley portion through extensive systems of irrigation works and artesian wells, and can be supplemented with surface and additional artesian wells.

Road-building materials are scarce, and resort will have to be made to mixtures of coarse sand and clay or adobe in proper proportions, and to hardpan, well disintegrated, wetted, and heavily rolled.

The districts own nine road-graders, three light road-rollers, and tools, but no official list of road-building machinery, with cost, age, and distribution, is kept.

The attention to and interest in road matters are greater than in many counties, and the results are manifest in many minor ways, but particularly in the details in accounts and records.

There are about 155 bridges in the county, most of which are of wood. In this, great saving can be accomplished by substituting concrete, brick, and salt-glazed sewer-pipe in small bridges, culverts, and drains.

TUOLUMNE COUNTY.

Organized: 1850.

Area: 2,232 square miles.

Visited: August 26, 1895, by Commissioners Manson and Irvine; June 19, 1896, by Commissioner Manson.

Mileage: 280.

Improved: No miles macadamized; 12 miles graveled; no miles sprinkled; 80 miles graded.

Title and Records: The title to most of the roads in Tuolumne County rests upon occupancy and usage. In suits against trespassers the defendant won on challenging the county's title to right of way, and showed that the county road really lay several hundred feet off the traveled road. The method of opening new roads is in accordance with the provisions of the Code. The road records consist of a volume entitled "Road Records of Tuolumne County," and which, if kept up, would show a great deal of information.

Manner of Construction and Maintenance: By day's labor, principally.

Accounts: The accounts are fairly well kept. District and general funds are kept separate, and warrants are legally and properly drawn in favor of individuals doing the work, attested by the Road Commissioner, and audited by the Board, but no exact record is kept of the location and extent of work.

Raising Money: By property and poll tax, and, in the early history of the county, by bond issue of $50,000.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	35	$10,377 25
1894	32	8,717 00
1893	32	8,623 65
1892	30	7,598 14
1891	30	7,328 34
1890	35	7,724 51
1889	30	6,369 44
1888	30	6,109 41
1887	35	5,806 99
1886	35	7,227 00
Total		$75,881 73

Tuolumne County occupies the west slope of the Sierras from the base of the foothills to the crest, and lies between the North Fork of the Stanislaus and the divide between the Tuolumne and Merçed rivers. The Stanislaus and Tuolumne drain the entire area, and flow through cañons of great depth and ruggedness. The lower edge of the county has a mean elevation of about 500 feet, and the higher peaks on the eastern boundary rise to 12,000 or more feet.

The mean rainfall in the lower portion is 15 inches, and in the upper, 45 inches. All the larger creeks and tributaries of the two rivers draining the county are perennial, and summer rains are common in the more elevated portions of the county. Water is therefore obtainable in nearly all localities.

Road-building materials are abundant and excellent, and consist of fair deposits of gravel in many of the creeks of the lower portion of the county, limestone well distributed through the central belt of the county, and hard volcanic and metamorphic rocks throughout the entire area, with a fair quality of hard quartz. With systematic work, nearly the entire mileage of roads could be metaled.

The roads, like those of most of the mountainous portions of the State, are not located upon true grade lines, and can only be improved by relocating, as has been done in a few notable instances in El Dorado, Tehama, and Riverside counties.

The use of stone for bridges has been commenced in Sonora, where an excellent stone bridge has replaced a costly and dangerous wooden one. This has, however, not been continued, but should be as soon as roads are permanently located upon the best grades and alignments which the topography will permit. The value of existing bridges is roughly estimated at $5,700.

The roads are badly drained. Water-breaks (or break-backs) are, unfortunately, used in the place of side ditches and stone under-drains; hence, many miles of road are badly washed out each winter. Instead of thorough drainage, earth filling is shoveled in, to be again washed out and replaced. This remark is true for thousands of miles of mountain and foothill roads, and is the cause of much expensive and useless outlay.

VENTURA COUNTY.

Organized: 1872.

Area: 1,850 square miles.

Visited: December 23, 1895, by Commissioners Maude and Irvine; August 3, 1896, by Commissioner Maude.

Mileage: No records to show it definitely. Probably, 700 or 800.

Improved: About 4 miles macadamized; 20 miles graveled; 22 miles sprinkled; 40 miles graded.

Title and Records: Title is very defective to all roads. In the case of new roads, more care is exercised, and titles are in better condition. In the case of the older roads, the title rested on usage and on ordinance of the Board of Supervisors. Of late years, the regulations prescribed by the Codes have generally been followed. Regular deeds are now required. All such records as exist are filed, but are not well indexed.

Manner of Construction and Maintenance: All new work of importance is done by contract. Day's labor for other work.

Accounts: Are kept in Auditor's office against road funds. Vouchers filed with County Clerk, but are not definitely segregated as to items of expenditure.

Raising Money: By direct taxation and road poll tax. During years 1889, 1890, and 1891, the sum of $1,250 was subscribed for road-sprinkling purposes.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	40	$27,240 88
1894	40	29,163 30
1893	40	31,696 98
1892	40	29,472 07
1891	40	27,824 81
1890	40	26,796 57
1889	40	30,883 28
1888	38	28,036 10
1887	38	21,543 71
1886	40	18,635 57
Total		$270,796 77

Ventura County is topographically divided into two distinct districts. The portion skirting the coast is of a level nature, and several valleys run therefrom to the interior in an easterly direction and toward Los Angeles County. The remainder of the county is rugged and mountainous.

The rainfall averages 17 inches, from October to April.

Materials suitable for road-surfacing abound throughout the county. Gravel is found in several districts; limestone and shale are found in the Ojai Valley, the latter making an excellent top-dressing; deposits of bituminous rock and asphaltum are found in several localities; cobbles of various character occur in several of the streams, and have been utilized to a certain extent, forming an excellent macadam when crushed. The county owns a rock-crushing plant, which has been intermittently used. The Bureau is in possession of some valuable detailed data in connection with the cost of the crushing, through the courtesy of the County Surveyor. We would recommend the continuance of its use.

The roads of this county should be sprinkled where practicable, and, owing to the soil conditions in the valley lands, a surfacing of the road with gravel, macadam, or other wearing surface is absolutely essential. In the mountainous portion of the county there are but few roads, but in these the matter of grading and location is of prime importance. Maintenance, other than the protection of these mountain roads from washing, is of small consideration.

The use of straw, which is prevalent on some of the sandy stretches of road in this county, should be discontinued, as it is an extremely expensive and temporary makeshift.

The encroachment of the railroad lines upon the county roads of this county should receive attention. Particularly is this the case on what is known as the coast road between Carpinteria and Ventura, where at one point the county roadway has been entirely taken for the roadbed of the railroad, and, as a consequence, the road has been forced over bowlders and through deep sand, and even this can be traveled only during certain stages of the tide, as at high tide it is covered several feet deep with water.

YOLO COUNTY.

Organized: 1850.

Area: 1,017 square miles.

Visited: June 25, 1895, by Commissioners Manson, Maude, and Irvine; June 27, 1896, by Commissioner Irvine.

Mileage: 650.

Improved: No miles macadamized; 335 miles graveled; no miles sprinkled; 500 miles graded.

Title and Records: Title to the greater portion of the roads is defective, though of late years an effort has been made to get deeds to all the new roads. Methods of obtaining titles are by purchase, condemnation, and grant. Records are in good condition for the past few years, and all new roads are mapped and recorded, but only about 33% of total mileage is recorded. No index kept.

Manner of Construction and Maintenance: Maintenance by day's labor; most of construction is by contract, under supervision of County Surveyor.

Accounts: Are kept against five districts, as the supervisoral districts are not subdivided.

Raising Money: By direct tax on all outside property, and by road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	24	$37,911 29
1894	20	43,508 31
1893	20	47,918 96
1892	25	48,401 51
1891	25½	48,339 46
1890	35	44,116 31
1889	20	38,099 11
1888	24	41,314 96
1887	23	41,180 00
1886	25	41,106 58
Total		$431,968 48

Yolo County lies on the west side of the Sacramento River, opposite the City of Sacramento, and extends westward into the rolling foothills of the Coast Range. Two thirds of its surface is valley land, the remainder being hilly. A large area is subject to inundation from the river, and is covered with tules, never having been reclaimed.

The beds of Cache and Putah creeks contain an inexhaustible supply of excellent gravel for road-building purposes, while the supply of other material is limited. Portions of the county have irrigation systems, and water can be had for sprinkling purposes at a minimum cost, either by pumping or by gravitation.

There are many miles of graveled roads throughout this county, but they require patching and repairing annually, as the traffic is exceedingly heavy during the summer and autumn. This could be obviated by judicious sprinkling, at less expense than is involved in repairs.

If more care were exercised in spreading the gravel, and a roller used, better results would follow.

The roads, as a rule, follow the section lines, thereby increasing the mileage and cost of maintenance.

A great deal of work on the roads, especially that of cuts, fills, and grading, is done by contract under the supervision of the County Surveyor, and most excellent results have been obtained. The report of the County Surveyor on a steel bridge constructed under his supervision shows a saving of 50%, an example worthy of emulation by other counties. Many extensive bridges have been erected. Owing to the sudden rising of streams, the maintenance of bridges is expensive.

The average rainfall in the lower valley portion of the county is about 16 inches, increasing to from 25 to 30 inches toward the western and more mountainous portion.

YUBA COUNTY.

Organized: 1850.

Area: 625 square miles.

Visited: October 30, 1895, by Commissioners Manson and Irvine; October 2, 1896, by Commissioner Irvine.

Mileage: 950.

Improved: No miles macadamized; 10 miles graveled; no miles sprinkled; 700 miles graded.

Title and Records: Title to about one eighth of the mileage is good; to the remainder, title is defective. Records are in fair condition, and all new roads are surveyed, mapped, and recorded.

Manner of Construction and Maintenance: By day's labor, under personal supervision of Road Commissioner.

Accounts: Are kept by districts, the supervisoral districts being subdivided.

Raising Money: By direct taxation and road poll tax.

Amount Expended in Past Ten Years.

Year.	Rate in Cents per $100.	Amount.
1895	36	$18,028 16
1894	25	16,100 29
1893	18	14,336 76
1892	25	17,296 38
1891	24	16,848 16
1890	39	22,644 11
1889	18.8	15,104 98
1888	20	15,561 67
1887	20	14,414 34
1886	25	15,522 42
Total		$165,857 27

Yuba County is bounded on the north by Butte, on the south by Placer, on the east by Nevada and Sierra, and on the west by Sutter. About one sixth of its area is valley land, one fifth rolling, and the remainder, mountainous.

Road-building material cannot be said to be abundant, though there are some gravel, trap, and basalt in some portions of the county. In the mountains are waste "dumps" from the mines that could be utilized to good advantage.

Water for sprinkling purposes is available throughout the entire county. The numerous streams in the mountains and ditches in the rolling hills furnish an unlimited supply by gravitation, while in the valleys wells and power for pumping would furnish all that might be necessary.

A new impetus seems to have been instilled into the Board of Supervisors since the first visit of the Commissioners to this county, and the County Surveyor is now engaged in surveying and mapping all the roads in the county. When completed, Yuba will be able to boast of one of the most complete road maps in this State, showing every road named and the distances between the points distinctly marked. All bridges and culverts will be numbered, so that if any repairs are necessary there will be no difficulty in ascertaining where the work is to be done and the kind and sizes of timber needed.

The mountain grades, like the majority of such, are not located on the easiest lines, but have, in many instances, been constructed so as to accommodate some interested individual, irrespective of the cost of maintenance or the welfare of the traveling public. No particular attention has been paid to the draining of these grades, and the soil on some of them, being extremely loose, washes badly during the rainy season. The roads through the rolling hills are naturally good if properly graded and drained. In the valley there are many miles of good road that have been graded, and a few graveled, all of which are in fair condition.

The City of Marysville is macadamizing some of the streets with rock from the State plant at Folsom, and contemplates further improvement in this direction.

The average rainfall in the valley is between 18 and 20 inches.

APPENDIX B.

PROPOSED AMENDMENTS TO EXISTING HIGHWAY LAWS.

The Bureau recommends the following changes in existing sections of the Political Code:

SECTION 2618. To be amended to read as follows:

Sec. 2618. In all counties of this State, public highways are roads, streets, alleys, lanes, courts, places, trails, and bridges, laid out or erected as such by the public, or if laid out and erected by others, dedicated or abandoned to the public, or made such in actions for the partition of real property; *provided*, that no route of travel used by one or more persons, over the lands of another, shall hereafter become a public road or byway by use, unless so declared by the Board of Supervisors, or by dedication by the owner of the land affected.

SECTION 2621. To be repealed.

SECTION 2623. To be amended to read as follows:

Sec. 2623. Any road laid out by the Board of Supervisors, as provided in this chapter, or used and worked as therein provided, shall not be vacated or cease to be a highway until so ordered by said Board, and each county shall be deemed to have acquired title to any road opened over any land in conformity to any order made by its Board of Supervisors, pursuant to this chapter, after one year shall have elapsed from the time of making the order opening the road; *provided*, no contest shall have previously been entered.

SECTION 2633. To be amended to read as follows:

Sec. 2633. Any owner or occupant of land adjoining a highway not less than three rods wide may plant deciduous trees in and along said highway on the side contiguous to his land. They must be set in regular rows at a distance of at least twenty feet from each other, and not more than six feet from the boundary of the highway. If the highway is more than eighty feet wide, the row must not be less than six, nor more than twelve, feet from the boundary of the highway. Whoever willfully injures any of them is liable to the owner or to the occupant for the damage which is thereby sustained; *provided*, if, in the judgment of the Board of Supervisors, the whole width of such road is needed for use for highway purposes, the whole thereof may be so used.

SECTION 2643. To be amended to read as follows:

Sec. 2643. The Board of Supervisors of the several counties of the State shall have general supervision over the roads within their respective counties. They must by proper order:

1. Cause to be surveyed, viewed, laid out, recorded, opened, and worked, such highways as are necessary to public convenience, as in this chapter provided;

2. Cause to be recorded as highways all highways which have become such by usage, dedication, or abandonment to the public, or by any other means provided by law, and to prepare and record proper deeds and titles thereto;

3. Abolish or abandon such as are not necessary;

4. Acquire the right of way over private property for the use of public highways, and for that purpose require the District Attorney to institute proceedings under title seven, part three, of the Code of Civil Procedure, and to pay therefor from the general road fund, or the district road fund of the county;

5. Levy a property tax for road purposes;

6. Cause to be erected and maintained, at the intersections and crossings of highways, guide-posts, properly inscribed;

7. Cause the road tax collected each year to be apportioned to the several road districts entitled thereto, and kept by the Treasurer in separate funds;

8. Audit all claims on the funds set apart for highway purposes, and specify the fund, or funds, from which the whole, or any part, of any claim, or claims, must be paid;

9. In their discretion, they may provide for the establishment of gates on the public highways in certain cases, to avoid the necessity of building road fences, and prescribe rules and regulations for closing the same, and penalties for violating said rules; *provided*, that the expense for the erection and maintenance of such gates shall in all cases be borne by the party, or parties, for whose immediate benefit the same shall be ordered;

10. For the purpose of watering roads in any part of the county, the Board of Supervisors may erect and maintain waterworks, and for such purpose may purchase or lease real or personal property. The costs for such waterworks and the watering of said roads may be charged to the general county fund, the general road fund, or the district fund of the district, or districts, benefited;

11. Whenever it shall be determined that any grading, graveling,

macadamizing, ditching, sprinkling, or other work upon highways is necessary, and is to be done, and where the estimated cost of such work amounts to three hundred dollars, the Board of Supervisors must, by proper order, direct the County Surveyor to make definite surveys of the proposed work, and to prepare profiles and cross-sections thereof, and to submit the same, with the estimate of the amount, or amounts, of work to be done, and the cost thereof, and with specifications therefor. Said report shall be prepared in duplicate, one copy to be filed in the Surveyor's office, and the other to be filed with the clerk of the Board of Supervisors. The Board, upon receipt of such report, must advertise for bids for the performance of the work specified. Such advertisement for bids must be published for two weeks in two newspapers, one published at the county seat, and the other at a point nearest the proposed work. Such advertisement must be in the following form:

"Office of the Clerk of the Board of Supervisors,
——— County, ——— ———, 189—.

"Sealed bids will be received by the Clerk of the Board of Supervisors of ——— County, at his office, until ——— o'clock —. M., ———, 189—, for ——— ——— on ———, in ——— District, in ——— County.

"Specifications for this work are on file in the office of the Clerk of said board, to which bidders are hereby referred.

"——— ———,

"Clerk of the Board of Supervisors of the County of ———."

And such advertisement must also be posted, for at least two weeks prior to the opening of the bids for the proposed work, in three conspicuous places in the district or districts in which the proposed work lies, and one at the site of the proposed work. Bids must be inclosed in a sealed envelope, addressed to the clerk of the Board of Supervisors, and must be indorsed, "Bids for ———," and must be delivered to said clerk prior to the hour specified in the advertisement. The board shall publicly open and read such bids as may be submitted, and must award the contract for the work to the lowest bidder; unless it shall appear to the board that the bids are too high, and the work can be done more cheaply by day labor, in which case the bids must be rejected, and the work ordered done by the road commissioner or commissioners in whose district or districts the work may be situated. In case the work shall be let to contract, monthly or quarterly payments may be made thereon, upon the receipt of a certified estimate by the County Surveyor of the amount of work done during the preceding month or quarter, to the extent of seventy-five per cent of the value of said work, the remaining twenty-five per cent being due on the completion of the work. The services of the surveyor in making such partial estimates must be paid for by the contractor. Upon the completion of the work the County Surveyor must examine the same, and, if completed in accordance with the specifications therefor, he must submit to the Board of Supervisors a certificate, over his signature and official seal, to the effect that such work by the contractor therefor has been completed in accordance with the specifications therefor, and recommending its acceptance. The board shall thereupon audit the same, and direct its payment out of the proper fund or funds.

SECTION 2645. To be amended to read as follows:

Sec. 2645. Road commissioners, under the direction and supervision and pursuant to orders of the Board of Supervisors, must:

1. Take charge of the highways within their respective districts, and shall employ all men, teams, watering-carts, and all help necessary to do the work in their respective districts when the same is not let by contract; *provided*, that no road commissioner shall be interested directly or indirectly in any contract work done, or material supplied, upon the highways in the county of which he is an officer;

2. Keep them clear from obstructions, and in good repair, and destroy, or cause to be destroyed, at least once a year, all thistles, Mexican cocklebure, of any kind, and all noxious weeds, growing or being on any portion of the public highways or public roads in their respective districts;

3. Cause banks to be graded, bridges and causeways to be made when necessary, keep the same in good repair, and renew them when destroyed.

SECTION 2652. To be amended to read as follows:

Sec. 2652. The Board of Supervisors may, annually, at any regular meeting held between the first days of January and March of each year, levy on each male person over twenty-one and under fifty-five years of age found in each road district during the time for the collection of road poll taxes for that year, excepting all persons who were honorably discharged from service in the army or navy of the United States at any time within the first day of April in the year of our Lord eighteen hundred and sixty-one, and the first day of September in the year of our Lord eighteen hundred and sixty-five, an annual road poll tax not exceeding three dollars; and from every such person not above excepted, in a road district who has not paid the same in some other district, must be collected the amount of road poll tax so levied. Said road poll tax shall be collected by the County Assessor in the same manner that State poll taxes are collected, and all remedies given by law for the collection of State poll taxes shall apply to and be in force for the collection of road poll taxes. Road poll tax receipts, in blank, signed and numbered in the same manner that other poll tax receipts are signed and numbered, shall be delivered by the Auditor of the county to said County

Assessor on or before the first Monday of March of each year; and said Assessor shall be charged with the amount of such road poll tax receipts delivered to him, and be credited with those returned, and shall settle with the Auditor, and pay over the amounts collected, in the manner provided by section thirty-eight hundred and fifty-three of this Code. Such road poll tax so collected shall be applied to and constitute a part of the district road fund of the district from which it was collected.

SECTION 2654. To be amended to read as follows:

Sec. 2654. The annual property tax for road purposes must be levied by the Board of Supervisors, at their session when the tax is by them levied for county purposes. This property road tax, when levied, must be annually assessed and collected by the same officers and in the same manner as other State and county taxes are levied, assessed, and collected, and turned over to the County Treasurer.

SECTION 2671. To be amended to read as follows:

Sec. 2671. Corporations, or other employers of persons, in any road district subject to the road tax, are chargeable for the road poll tax assessed against their employés to the extent of any credit in their hands not exceeding such tax; *provided*, the Assessor shall first give notice to such employer, or the managing agent of such corporation, and from the time of such notice the amount of any credit in his hands, or that shall thereafter accrue, sufficient to satisfy said tax, shall be paid to the Assessor, whose receipt shall be evidence in bar of the prosecution of any action by the employé against the principal for the recovery of the same.

SECTION 2681. To be amended to read as follows:

Sec. 2681. Any ten or more resident freeholders of a section which may be benefited by the construction of a new road, the correction, or alteration, or discontinuance and abandonment of an existing road, may petition the Board or Boards of Supervisors of the county or counties in which the proposed or existing road, in whole or in part, lies, in the form herein provided. In case the petition relate to a section situated in more than one county, copies of the petition must be presented to the Board of Supervisors of each county.

SECTION 2682. To be amended to read as follows:

Sec. 2682. The petition must set forth the terminal points of the road which it is proposed to construct, alter, or abandon, the general route, and the names of the owners of lands affected by the action of the petition, if known, and if not known, that fact must be stated.

SECTION 2683. To be amended to read as follows:

Sec. 2683. The petition must be accompanied by a good and sufficient bond, to be approved by the Board of Supervisors, in double the amount of the probable cost of surveying, viewing, and estimating the exact nature and cost of the matter petitioned for, and conditioned that in case the petition be not granted the bondsmen will pay all costs of surveying, viewing, and estimating the nature of the matters petitioned for, and further providing that in no case shall any costs incurred become a charge against the county, or payable out of any county funds.

SECTION 2684. To be amended to read as follows:

Sec. 2684. Upon filing such petition and bond, the Board of Supervisors must appoint three viewers, one of whom must be the County Surveyor, one the County Assessor, and the third a disinterested freeholder of the county, not resident in the district affected, to view and survey any proposed alteration of an old, or opening of a new road, and submit to the board an estimate of the change, alteration, or opening, together with the probable cost thereof, including the purchase of the right of way, and their views of the necessity thereof.

SECTION 2685. To be amended to read as follows:

Sec. 2685. The road viewers must be sworn to discharge their duties faithfully, must view and lay out the proposed alterations or new road over the lightest grades and most direct alignments which the nature and topography of the country will permit; they must notify the resident owners, or agent of the owners, of the lands affected by the matter petitioned for. A majority number of the viewers, providing one shall be the County Surveyor, shall be competent to act in all matters pertaining to their duties mentioned in this chapter. The Board of Supervisors, in making the order appointing viewers, may, in their discretion, direct said viewers to first view the proposed road, and if, in the opinion of the viewers, the road be impracticable or unnecessary, the said viewers shall discontinue further proceedings in the matter, and report accordingly.

SECTION 2686. When the view and survey of the proposed alteration or new road is completed, the viewers must report to the Board of Supervisors:

1. The course, termini, length, and probable cost of construction of the proposed road;

2. The estimate of damage to the owner of any land over which it is proposed to run the road;

3. The names of land-owners who consent to give the right of way, and their written consent thereto;

4. The names of land-owners who do not consent, and the amount of damage claimed by each; *provided*, that when there are non-resident land-owners, and no agent upon the land upon whom notice can be served, such non-resident land-owners shall be considered as non-consenting land-owners, unless their written consent shall have been obtained;

5. Such other facts bearing upon the subject, of importance to be known by the Board of Supervisors.

SECTION 2687. To be amended to read as follows:

Sec. 2687. The viewers must be paid as follows: The Surveyor and Assessor must be paid their actual expenses whilst in the discharge of their duty, and if the services of assistants, chainmen, and laborers be necessary, the Surveyor must present a sworn bill of the cost of their services and actual expenses, which must be paid as herein provided. The third member of the board of viewers shall be paid three dollars per day for the time occupied in the discharge of his duties. These payments, in case the petition be not granted, must be paid by the signers of the bond accompanying the petition, and shall in no way become due or be paid from highway funds. In case the petition be favorably acted upon, these expenses must be paid from such highway fund or funds as the Board of Supervisors shall direct.

SECTION 2691. To be amended to read as follows:

Sec. 2691. All awards by agreement, determined by the board or the proper court, must be paid out of the road fund of the district, except that which may be paid by interested parties, on the order of the Board of Supervisors, and except also that whenever it appears to the Board of Supervisors that any road district would be unreasonably burdened by the payment of such awards and expenses, the Board of Supervisors, by a two-thirds vote, may cause a portion of such awards and expenses to be paid from the general road fund; *provided, however*, that not to exceed ten per cent of the general road fund shall be devoted to such purposes in any one fiscal year. If the road lies in more than one district, the Board of Supervisors must proportionately divide the awards and other costs between said districts; *provided, however*, that when money is paid out by any interested person the same may be given to the credit of either fund, at the discretion of the board.

SECTION 2692. To be amended to read as follows:

Sec. 2692. Private or by-roads may be opened, laid out, or altered for the convenience of one or more residents or freeholders of any road district, in the same manner as public roads are opened, laid out, or altered, except that only one petitioner shall be necessary, who must be either a resident or freeholder in said road district; and the Board of

Supervisors may, for like cause, order the same to be viewed, opened, laid out, or altered, the person for whose benefit said road is required paying the damages awarded to land-owners, and keeping the same in repair; *provided*, that the petitioners must accompany the petition with a bond mentioned in section twenty-six hundred and eighty-three, conditioned as provided in said section, and with a further condition that the bondsmen will pay to the person over whose land said road is sought to be opened his necessary costs and disbursements in contesting the opening of such road, in case the petition be not granted and the road finally not opened.

SECTION 2695. To be amended to read as follows:

Sec. 2695. When the alteration of an old or the opening of a new road makes it necessary to remove fences on land given, purchased, or condemned by order of a court for road or highway purposes, written notice to remove the fences must be given by the road commissioner to the owner, his occupant, or agent, or by posting the same on the fence; and if the same is not done within ten days thereafter, or commenced and prosecuted with due diligence, the road commissioner may cause it to be carefully removed, at the expense of the owner, and recover of him the cost of such removal, and the fence material may be sold to satisfy the judgment.

SECTION 2696. To be amended to read as follows:

Sec. 2696. Whenever it shall become necessary to acquire land in order to raise the banks along any stream, or remove obstructions therefrom, or widen, deepen, or straighten their channels, for the purpose of protecting any public road or highway, the Board of Supervisors must, by order, direct proceedings to procure the land necessary for such purpose, to be instituted by the District Attorney of the county, in the name of the county, under and as provided in title seven, part three, of the Code of Civil Procedure, unless the right of way can be acquired by gift or purchase.

SECTION 2715. To be amended to read as follows:

Sec. 2715. If the road commissioner of any road district, chargeable with the repair of a bridge, fails to make the needed repairs, after being informed that a bridge is impassable or unsafe, and is requested to make the same by two or more freeholders of the district in which it is situated, or the two districts which it unites, the freeholders may represent the fact to the Board of Supervisors, who, upon being satisfied that the bridge is unsafe, must cause the same to be repaired.

SECTION 2716. To be amended to read as follows:

Sec. 2716. The Board of Supervisors of each county must hold special meetings on the third Monday in July and the third Monday in January, for the consideration of highway matters and interests. At these meetings each Supervisor, as ex officio road commissioner, must submit in writing a report upon the expenditures made and work performed in his district during the previous six months. Such report must show:

1. The mileage of permanently located and improved roadway, by what method and from what material constructed;

2. The number, location, and character of permanent bridges, culverts, and drains constructed;

3. The character and extent of water supply developed for road-sprinkling, and the mileage of sprinkled road, with the total and per mile cost;

4. The character, condition, and number of all types of road machinery and tools owned by the county or district, and used in his district;

5. Recommendations as to the road management of his district for the ensuing six months, and the scope of work contemplated;

6. Retiring commissioners shall make their reports to and through their successors. A certified copy of each report must, within ten days, be forwarded by the clerk of the board to the State Bureau of Highways.

SECTION 2731. To be amended to read as follows:

Sec. 2731. If any highway duly laid out or erected is encroached upon, by fences, buildings, or otherwise, the road commissioner of the district must, in writing, require the encroachment to be removed from the highway.

SECTION 2734. To be amended to read as follows:

Sec. 2734. If the encroachment be denied, and the owner, occupant, or person controlling the matter or thing charged with being an encroachment, refuses either to remove or permit the removal thereof, the Board of Supervisors must direct the District Attorney to institute an action to abate the same as a nuisance; and if he recovers judgment, he may, in addition to having the same abated, recover ten dollars for every day such nuisance remained after notice, and also his costs in said action.

SECTION 2735. To be amended to read as follows:

Sec. 2735. If the encroachment is not denied, but is not removed for five days after the notice is complete, the road commissioner must remove the same at the expense of the owner, occupant, or person controlling the same, and recover his costs and expenses, together with the penalty provided for in the preceding section.

SECTION 2737. To be amended to read as follows:

Sec. 2737. Whoever obstructs or injures any highway, or diverts any watercourse thereon, or drains water from his land upon any highway, to the injury thereof, by means of ditches or dams, is liable to a penalty of ten dollars for each day such obstruction or injury remains, and must be punished as provided in section five hundred and eighty-eight of the Penal Code. Any person, persons, or corporation, who shall be storing or distributing water for any purpose, and shall permit the water to overflow, or saturate by seepage, any highway, to the injury thereof, shall, upon notification of the road commissioner of the district where such overflow or seepage occurs, repair the damages occasioned by such overflow or seepage; and should such repair not be made within ten days by such person, persons, or corporation, said road commissioner shall make such repairs and recover the expense thereof from such person, persons, or corporation, in an action at law. All persons excavating irrigation, mining, or drainage ditches across public highways are required to permanently bridge said ditches at such crossings, and upon neglect to do so, the road commissioner for that road district shall construct the same and recover the cost of constructing, of such persons, by action, as provided in this section. And whoever willfully injures any public bridge is hereby declared to be guilty of a misdemeanor, and is also liable for actual damages for such injury, to be recovered by the county in a civil action; *provided*, that every person who knowingly allows the carcass of any dead animal (which animal belongs to him at the time of its death) to be put or to remain within one hundred feet of any street, alley, public highway, or road in common use, and every person who puts the carcass of any dead animal within one hundred feet of any street, alley, highway, or road in common use, or who shall deposit on any highway any refuse or waste, is guilty of a misdemeanor.

EXPENDITURES OF BUREAU

UP TO AND INCLUDING NOVEMBER 1, 1896.

SALARIES.

Commissioners' salaries from April 11, 1895—three Commissioners, at $250 per month each	$14,000 00
Clerk's salary from June 1, 1895, at $100 per month	1,700 00
Stenographer's salary from June 1, 1895, at $90 per month	1,530 00
Janitor's salaries from July 1, 1895	450 00
Draughtsman's salary from May 15, 1896	412 50
	$18,092 50

TRAVELING EXPENSES.

R. C. Irvine—		
1895—July 26	$103 50	
Aug. 6	38 90	
Oct. 12	60 00	
Nov. 5	17 00	
Nov. 20	64 45	
1896—Jan. 15	81 00	
Jan. 18	115 05	
Mar. 23	99 40	
May 4	23 65	
May 25	29 65	
July 23	34 20	
Aug. 29	135 65	
Sept. 8	165 90	
Oct. 28	97 55	
		$1,065 90
Marsden Manson—		
1895—July 26	$49 05	
Aug. 6	73 10	
Aug. 6	102 10	
Oct. 12	75 70	
Nov. 5	17 45	
Nov. 20	59 75	
1896—Jan. 15	123 50	
Mar. 23	222 30	
June 16	58 05	
Aug. 31	72 95	
Sept. 26	339 75	
Oct. 28	36 15	
		1,229 85
J. L. Maude—		
1895—July 1	$150 60	
Aug. 6	6 35	
Oct. 12	54 95	
Amounts carried forward	$211 90	$2,295 75

Amounts brought forward	$211 90	$2,295 75
J. L. Maude—Continued.		
1896—Jan. 8	193 90	
Feb. 7	174 40	
Mar. 11	155 70	
Apr. 16	21 05	
July 8	57 00	
Aug. 6	206 90	
		1,020 85
E. Myron Wolf—		
1895—Sept. 25	$20 35	
1896—Mar. 11	28 05	
June 12	15 35	
Aug. 29	3 65	
Sept. 8	26 85	
		94 25
J. H. Watkins—		
1895—Sept. 1	$18 65	
		18 65
		$3,429 50

MISCELLANEOUS.

1895—July 26—	B. R. Crocker	$175 00
	D. McKay	28 50
	Sayre & Son	53 20
	D. Ahern	8 00
	Oscar Foss	98 00
	H. S. Crocker & Co.	22 68
	Western Union Telegraph Co.	5 25
	R. Philip	5 00
	Hevener, Mier & Co.	5 75
	F. S. Smith	8 25
Aug. 6—	H. C. Chipman	7 00
	F. H. Wing	10 00
	E. J. Croly	35 00
	S. W. Butler	1 40
Oct. 12—	A. Leitz Co.	43 75
	Sayre & Son	7 60
	H. S. Crocker & Co.	28 77
	Western Union Telegraph Co.	6 05
	Tom Scott	31 70
	D. Falconer	36 23
	Holbrook, Merrill & Stetson	4 00
	Bancroft-Whitney Co.	4 80
	Fashion Stables	3 00
	E. J. Croly	38 00
	D. Weiman	75
	Carfare for porter	1 25
	Postage stamps	5 00
Nov. 5—	Weinstock, Lubin & Co.	5 95
	H. S. Crocker & Co.	2 75
	Western Union Telegraph Co.	2 96
	Willis & Clements	10 80
	G. G. Wickson & Co.	140 00
	J. F. Hill	165 00
	E. J. Croly	20 00
	F. M. Jones	2 50
	Postage stamps	5 00
	Carfare for porter	1 00
	Amount carried forward	$1,029 89

Date	Payee	Amount
	Amount brought forward	$1,029 39
1895—Nov. 5	Oscar Foss	23 50
	Wells, Fargo & Co.	25
Nov. 20	H. S. Crocker & Co.	9 55
	Wells, Fargo & Co.	1 05
	C. W. Goddard	4 00
	J. W. Wilson & Son	12 00
	Western Union Telegraph Co.	4 55
	Schad Bros.	37 40
	H. C. Chipman	11 00
	W. F. Cutler	12 35
Dec. 9	H. K. Wallace	50
	Weinstock, Lubin & Co.	2 10
	Postage stamps	1 00
	L. D. Stone & Co.	10 00
	G. G. Wickson	2 90
	Press Clipping Bureau	8 00
	Press Clipping Bureau	6 00
	Press Clipping Bureau	3 00
1896—Jan. 15	A. K. Varney	6 00
	H. S. Crocker & Co	75
	Western Union Telegraph Co.	49
	Sayre & Son	4 25
	D. McKay	3 00
	Schad Bros.	21 35
	Postage stamps	2 00
	Wells, Fargo & Co.	50
	Postage stamps	1 00
	Union Ice Co.	14 90
	Press Clipping Bureau	6 00
	Weinstock, Lubin & Co.	1 50
	Postage stamps	1 00
Feb. 18	John Breuner	368 55
	Southern Pacific Co.	2 20
	Oscar Foss	15 40
	Sunset Telephone Co.	25
	Oscar Foss	28 00
	Postage stamps	2 00
	Postage stamps	2 00
	Western Union Telegraph Co.	1 25
	Wells, Fargo & Co.	90
	M. M. Davis	5 00
Mar. 23	A. Leitz Co.	5 50
	Sunset Telephone Co.	1 10
	Press Clipping Bureau	3 00
	Weinstock, Lubin & Co.	2 50
	Postage stamps	5 00
	Mason Towel Supply Co.	5 50
	Western Union Telegraph Co.	1 90
	D. Ahern	4 50
	Postage stamps	20 00
	Wells, Fargo & Co.	85
April 21	Schad Bros.	49 30
	Press Clipping Bureau	6 00
	H. S. Crocker & Co.	45
	Sunset Telephone Co.	75
	Weinstock, Lubin & Co.	2 95
	Amount carried forward	$1,776 13

	Amount brought forward	$1,776 13
1896—April 21—	C. B. Murphy	5 00
	L. Santini	75 00
	Southern Pacific Co.	1 25
	G. H. Wheeler	1 00
	Bassett & Minford	25 50
	E. Myron Wolf	20
May 4—	Antonio Iaacheri	14 00
	Bassett & Minford	2 50
	C. J. Peters	2 75
	W. P. Fuller & Co.	8 50
	Holbrook, Merrill & Stetson	1 55
	F. H. Wing	1 25
	E. Myron Wolf	1 50
25—	Baker & Hamilton	4 00
	Western Union Telegraph Co.	1 26
	J. H. Watkins	30
June 2—	G. W. Rogers	8 00
16—	Postage stamps	7 00
30—	C. Suter	6 25
"	Tom Scott	7 20
	F. W. Wright & Co.	2 50
	Baker & Hamilton	1 10
	Wells, Fargo & Co.	1 20
	Office Specialty Manufacturing Co.	25 95
	Press Clipping Bureau	6 00
	Postal cards	1 00
	Postage stamps	20 00
	Schaw-Ingram-Batcher Co.	4 00
July 23—	Press Clipping Bureau	3 00
	Sacramento Transportation Co.	6 05
	Bassett & Minford	1 00
	Wells, Fargo & Co.	50
	Tom Scott	1 50
	Fashion Stables	13 65
	D. Flint	12 80
	Sayre & Son	2 85
	Capitol Electric Works	5 85
	C. W. Goddard	4 00
	J. F. Toomey	100 00
	Sayre & Son	34 80
Aug. 29—	H. S. Crocker & Co.	4 20
	Wm. McLaughlin	2 50
	Hevener, Mier & Co.	4 50
	Sunset Telephone Co.	1 75
	D. McKay	13 50
	A. Holmes	10 35
	M. P. Henderson & Son	2 00
	Postage stamps	20 00
	Western Union Telegraph Co.	5 70
	C. H. Rave	6 00
	L. S. Griswold	45
	Fashion Stables	57 50
	Fashion Stables	30 00
	G. F. Gillenwater	3 00
Sept. 25—	Schad Bros.	37 00
	Sayre & Son	3 00
	J. T. Stoll	1 50
	Amount carried forward	$2,400 84

	Amount brought forward	$2,400 84
1896—Sept. 25	—J. H. Watkins	95
Oct. 28	—Press Clipping Bureau	9 00
	Sacramento Transportation Co.	7 65
	H. W. Rivett	2 50
	Western Union Telegraph Co.	1 86
	Western Union Telegraph Co.	1 65
	Bolton & Strong	8 65
	Wells, Fargo & Co.	80
	Wells, Fargo & Co.	2 62
	Sullivan-Kelly Co.	5 45
	Goodyear Rubber Co.	2 50
	C. W. Goddard	2 00
	C. W. Goddard	4 00
	Sunset Telephone Co.	1 95
	H. S. Crocker & Co.	1 30
		$2,453 72

RECAPITULATION.

Salaries	$18,092 50
Traveling expenses	3,429 50
Miscellaneous	2,453 72
Total	$23,975 72
Appropriation for Bureau	$31,000 00
Total expenditures up to November 1, 1896	23,975 72
Balance	$7,024 28

Making due allowances for such expenditures as must be made before the expiration of the term of existence of the Bureau, there will remain a surplus to be returned to the State.

The dates of expenditures given indicate the dates of payments.

The Bureau has a special form of voucher, in original and duplicate, on which all bills contracted by the Bureau are made out. The originals are transmitted to the Board of Examiners, and by them filed with the State Controller. The duplicates, receipted, are all numbered and filed in the office of the Bureau.

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Statement, Compiled from Accounts of County Auditors and Other Sources, Showing Financial Status of the State of California, Relative to Road Moneys, Etc., for Fiscal Year Ending June 30, 1895.

County.	Total Assessed Valuation of All Property in the County.	Total Assessed Valuation of Property Subject to Road Tax.	Rate of Taxation for Road Purposes on $100 Assessed Valuation.	Total Amount of Money Raised by Direct Taxation for Road Purposes.	Total Amount of Money Raised from Road Poll Tax.	Amount of Money Raised for Road Purposes by Transfer of Funds and from Other Sources.	Total Amount of Money Raised for Road Purposes from All Sources.	Area in Square Miles.	Miles of Road (Approximated).	Number of Square Miles of Area to Each Mile of Road.	Population, Census of 1890.	Number of Linear Yards of Road to Each Inhabitant.	Expenditure per Year per Mile.	Expenditure per Year per Inhabitant.
			Cents.											
Alameda	$94,304,497	$27,126,540	35	$94,942 89	$6,902 85	....	$101,845 74	840	453	1.85	93,864	8	$224 82	$1 08
Alpine	257,801	257,801	45	968 47	156 10	$20 00	1,144 57	575	54	10.65	667	142	21 19	1 71
Amador	4,003,424	4,003,424	36½	13,510 20	2,542 35	17 50	16,070 05	568	400	1.42	10,320	68	40 17	1 56
Butte	14,402,403	12,077,281	34	41,062 75	3,887 00	16,070 00	61,019 75	1,764	1,200	1.47	10,320	204	50 85	5 91
Calaveras	4,683,635	4,683,635	25	11,123 55	2,940 00	....	14,063 55	990	470	2.11	8,882	93	29 90	1 58
Colusa	11,368,908	10,395,901	28	29,108 52	....	....	29,108 52	1,080	566	1.91	7,640	130	51 43	3 81
Contra Costa	15,380,005	14,613,610	30	43,840 83	3,388 10	8,000 00	55,228 93	750	450	1.67	13,515	58	122 73	4 06
Del Norte	1,891,766	1,624,593	35	5,552 14	451 35	....	6,003 49	1,546	102	15.16	2,592	69	58 85	2 31
El Dorado	3,851,047	3,851,047	33	13,023 90	1,834 30	....	14,858 20	1,891	896	2.11	9,232	170	16 58	1 61
Fresno	26,590,806	19,277,052	25	48,192 63	6,527 15	....	54,719 78	5,940	1,435	4.14	24,526	103	38 13	2 23
Glenn	9,635,326	9,190,690	30	27,572 08	....	177 06	27,749 14	1,248	440	2.84	7,000	110	63 06	3 96
Humboldt	17,118,241	12,294,001	40	48,480 52	7,824 00	22,088 11	78,392 63	3,507	1,020	3.44	23,469	76	76 85	3 34
Inyo	1,605,989	1,605,989	14½	3,725 98	974 00	....	4,699 98	10,224	458	22.32	3,544	225	10 26	1 33
Kern	16,543,327	12,678,858	18	28,779 60	5,038 50	30,973 48	64,791 58	8,159	1,023	7.97	9,808	184	63 33	6 66
Kings	6,229,674	5,514,144	20	6,564 45	....	....	6,564 45	1,257	375	3.35	9,000	73	17 50	73
Lake	3,074,078	2,709,226	40	10,839 10	1,286 43	2,000 00	14,125 53	1,332	475	2.80	7,101	118	29 74	1 99
Lassen	2,316,931	2,316,931	35	6,847 01	1,171 30	....	8,018 31	4,750	710	6.69	4,239	295	11 29	1 89
Los Angeles	84,817,151	27,135,416	30	81,406 25	5,907 00	1,229 85	88,543 10	3,957	1,200	3.30	101,454	20	73 78	87
Madera	6,231,046	6,231,046	34	24,808 79	1,509 60	....	26,318 39	2,140	395	5.42	7,500	92	66 63	3 51
Marin	11,975,649	8,090,254	22	17,561 35	2,654 50	....	20,215 85	516	235	2.19	13,072	31	86 02	1 54
Mariposa	1,851,635	1,851,635	25	3,916 68	1,759 50	16,125 00	21,801 18	1,580	400	3.95	3,787	186	54 50	5 76
Mendocino	11,713,789	9,234,191	36	40,420 00	5,603 25	1,500 00	47,523 25	3,460	1,200	2.88	17,612	119	39 60	2 69
Merced	12,748,493	11,657,642	34	46,515 25	....	450 00	46,965 25	1,750	400	4.37	8,085	87	117 41	5 81
Modoc	2,695,454	2,695,454	30	5,455 70	1,379 15	1,381 88	8,216 73	4,097	688	5.95	4,986	243	13 44	1 65
Mono	830,237	830,237	10	767 99	409 40	755 74	1,933 13	2,796	374	7.48	2,002	328	5 17	96
Monterey	16,754,371	14,060,338	20	27,417 66	2,439 50	....	29,857 16	3,450	600	5.75	18,637	57	49 76	1 60
Napa	12,541,764	7,640,374	38	30,238 32	2,864 50	....	33,102 82	800	550	1.46	16,411	59	60 18	2 02
Nevada	6,323,059	3,809,805	40	15,239 22	3,345 60	....	18,584 82	958	500	1.91	17,369	50	37 17	1 07
Orange	9,692,358	6,438,851	28	18,816 10	2,199 80	1,933 10	22,949 00	780	375	2.08	13,589	48	61 20	1 69
Placer	10,065,084	9,980,770	30	29,212 31	2,961 40	....	32,173 71	1,484	750	1.98	15,101	87	42 90	2 13
Plumas	2,283,849	2,283,849	40	11,419 24	1,800 00	9,934 47	23,153 71	2,361	414	5.70	4,933	148	55 92	4 69
Riverside	12,434,994	7,520,667	18	12,706 99	3,076 20	6,738 60	22,521 79	7,008	700	10.01	16,646	74	32 17	1 35
Sacramento	33,831,194	14,560,043	25	36,400 10	5,241 10	6,382 04	48,023 24	1,007	1,500	0.67	40,339	65	32 01	1 19
San Benito	6,568,827	5,806,502	22	12,135 59	....	....	12,135 59	1,476	600	2.46	6,412	165	20 22	1 89
San Bernardino	17,617,471	9,764,376	25	24,410 94	....	....	24,410 94	20,055	800	25.07	15,819	89	30 51	1 54
San Diego	22,304,004	6,853,865	35	21,920 25	3,799 00	2,375 00	28,094 25	8,400	5,000	1.68	28,019	314	5 62	1 00
San Francisco (see note)	....	....	....	....	....	....	....	....	....	....	....	....	....	....
San Joaquin	31,647,948	20,599,604	18	37,533 76	....	500 00	38,033 76	1,370	950	1.44	28,629	58	40 04	1 33
San Luis Obispo	12,951,856	11,188,777	25	26,732 44	2,873 00	15,699 09	45,304 53	3,500	1,050	3.33	16,072	115	43 14	2 82
San Mateo	17,906,468	14,896,185	39½	59,038 32	1,174 70	901 39	61,114 41	470	334	1.41	10,087	58	182 97	6 06
Santa Barbara	14,431,326	10,367,612	35	35,328 03	2,577 90	120 30	38,026 23	2,450	1,200	2.04	15,754	134	31 68	2 41
Santa Clara	56,723,127	33,379,615	30	100,138 84	....	3,494 75	103,633 59	1,355	775	1.75	48,005	28	133 87	2 16
Santa Cruz	12,011,121	7,190,711	40	27,324 70	3,529 20	....	30,853 90	425	400	1.06	19,270	36	77 13	1 60
Shasta	7,075,074	6,172,607	25	19,628 19	2,216 53	....	21,844 72	4,050	1,500	2.70	12,133	217	14 56	1 80
Sierra	1,415,654	1,415,654	40	5,006 22	2,065 50	....	7,071 72	910	500	1.82	5,051	158	14 14	1 40
Siskiyou	9,495,080	9,020,756	25	22,551 89	5,367 00	....	27,918 89	6,078	2,500	2.43	12,163	362	11 16	2 30
Solano	17,019,742	12,837,347	35	44,930 45	2,680 00	....	47,610 45	911	600	1.52	20,946	50	79 35	2 26
Sonoma	27,175,145	18,848,568	22	41,466 85	9,351 00	....	50,817 85	1,540	1,200	1.28	32,721	64	42 35	1 56
Stanislaus	15,657,017	15,641,217	20	31,282 43	....	....	31,282 43	1,486	450	3.30	10,040	78	69 52	3 11
Sutter	6,947,208	6,947,208	9	6,128 93	1,187 30	....	7,316 23	611	330	1.85	5,469	106	22 17	1 34
Tehama	9,419,997	8,155,948	28	20,155 75	1,298 15	....	21,453 90	3,200	620	5.16	9,916	110	34 60	2 16
Trinity	1,338,259	1,338,259	15	2,005 93	2,388 00	....	4,393 93	3,276	624	5.25	3,719	295	7 04	1 18
Tulare	15,289,870	13,456,399	30	39,188 03	3,343 10	538 88	43,070 01	4,935	2,185	2.36	24,574	156	19 71	1 75
Tuolumne	3,482,785	2,889,705	35	9,613 25	764 00	....	10,377 25	2,232	280	7.97	6,082	81	37 06	1 70
Ventura	7,479,124	6,589,855	40	25,568 43	1,671 95	....	27,240 38	1,850	750	2.47	10,071	131	36 32	2 70
Yolo	16,748,512	14,469,614	24	34,671 46	2,036 60	1,203 23	37,911 29	1,017	650	1.56	12,684	88	58 32	2 98
Yuba	5,915,435	3,546,194	36	10,489 66	1,538 50	6,000 00	18,028 16	625	950	0.66	9,636	173	18 98	1 87
Totals	$806,669,035	$520,217,873	....	$1,493,686 91	$137,935 36	$156,609 47	$1,788,231 74	....	45,056	....	....	....	....	....

NOTES.

Owing to lack of data in majority of counties, the Bureau finds it impossible to give exact mileage.

San Francisco City and County: Expenditures for streets and roads in the City and County of San Francisco, exclusive of sewers and sidewalks, for year 1895 were $1,027,575 38. Expenditures on roads about $10,000 per annum. Alpine County: 45-cent rate includes a levy for bridge purposes. Stanislaus County: Assessed valuation for county purposes given. Sutter County: An additional tax is levied for bridge purposes.

Statement, Compiled from Accounts of County Auditors, Showing Amount of Money Raised for Road Purposes from All Sources for Eleven Years, 1885–1895, Inclusive.

Counties.	Amount of Money Raised by Direct Taxation.	Amount of Money Raised by Road Poll Tax.	Amount of Money Raised by Transfer of Funds, or from any other Source.	Total Amount of Money Raised in 11 Years from All Sources.
Alameda	$792,324 92	$80,143 95		$872,468 87
Alpine	4,612 75	1,687 10	$291 01	6,590 86
Amador	141,201 06	30,308 80	17 50	171,527 36
Butte	463,078 96	48,915 00	127,967 00	639,960 96
Calaveras	90,738 78	23,861 00	2,050 00	116,649 78
Colusa	596,445 97	36,208 00		632,653 97
Contra Costa	483,607 36	34,698 70	8,000 00	526,306 06
Del Norte	68,043 46	6,264 50	20,357 22	94,665 18
El Dorado	114,970 69	46,877 90	15,728 33	177,576 92
Fresno	574,852 35	47,648 43	11,550 00	634,050 78
Glenn	112,064 53	2,691 60	177 06	114,933 19
Humboldt	368,938 80	78,759 00	307,868 13	755,565 93
Inyo	32,775 49	7,463 00		40,238 49
Kern	264,284 17	25,925 13	217,916 69	508,125 99
Kings	20,823 45			20,823 45
Lake	122,729 41	9,308 78	19,500 00	151,538 19
Lassen	75,604 14	9,995 40		85,599 54
Los Angeles	828,147 07	66,941 40	8,802 52	903,890 99
Madera	42,645 56	2,937 60	511 20	46,094 36
Marin	200,841 10	36,541 39	2,969 58	240,352 07
Mariposa	45,975 30	9,491 75	16,125 00	71,592 05
Mendocino	428,052 00	22,394 55	90,778 00	541,224 55
Merced	534,337 62	6,468 00	600 00	541,405 62
Modoc	63,949 40	17,199 21	10,670 14	91,818 75
Mono	8,094 21	6,531 95	1,535 74	16,161 90
Monterey	309,885 85	11,598 65	159,515 00	480,999 50
Napa	306,415 86	39,661 06		346,076 92
Nevada	169,482 44	43,884 13		213,366 57
Orange	127,574 62	9,939 35	1,933 10	139,447 07
Placer	304,884 84	30,928 95	16,500 00	352,313 79
Plumas	93,286 84	24,291 00	73,198 80	190,776 64
Riverside	44,929 26	6,038 55	39,348 68	90,316 49
Sacramento	373,433 48	32,205 60	47,994 61	453,633 69
San Benito	128,509 74	12,940 00	495 62	141,945 36
San Bernardino	272,536 36	7,625 58	6,000 00	286,161 94
San Diego	281,912 34	6,707 00	119,010 07	407,629 41
San Francisco (see note)				
San Joaquin	502,477 61		500 00	502,977 61
San Luis Obispo	337,833 50	27,678 22	89,735 46	455,247 18
San Mateo	507,357 79	16,173 60	8,901 39	532,432 78
Santa Barbara	398,831 61	2,577 90	210 30	401,619 81
Santa Clara	986,709 18		37,885 23	1,024,594 41
Santa Cruz	256,502 69	31,923 45	8,009 76	296,435 90
Shasta	158,085 25	13,049 18	2,067 00	173,201 43
Sierra	64,611 54	22,981 39		87,592 93
Siskiyou	141,823 91	61,164 00	30,000 00	232,987 91
Solano	435,145 92	8,024 00		443,169 92
Sonoma	436,283 16	72,820 00		509,103 16
Stanislaus	261,235 60	6,644 00		267,879 60
Sutter	44,659 76	14,434 49		59,094 25
Tehama	175,426 05	21,917 30	63,107 50	260,450 85
Trinity	25,942 35	21,086 40	14,000 00	61,028 75
Tulare	440,059 23	57,186 50	24,306 35	521,552 08
Tuolumne	79,286 47	2,833 00		82,119 47
Ventura	271,949 06	15,345 16	1,250 50	288,544 72
Yolo	444,121 04	28,398 50	1,297 72	473,817 26
Yuba	99,938 43	15,316 10	66,000 00	181,254 53
Totals	$14,960,370 63	$1,324,644 90	$1,674,702 21	$17,959,717 74

NOTES.

San Francisco City and County: Expenditures for streets and roads in the City and County of San Francisco, exclusive of sewers and sidewalks, for years mentioned, were $10,914,931 19. Expenditures on roads proper average $10,000 per annum. Neither of these amounts included in this statement.

Alpine County: In years 1885 and 1886 no road tax collected, almost all roads being toll roads. Other roads maintained by voluntary subscription.

Colusa County: On account of condition of records, it was found necessary to approximate road funds for years 1885, 1886, and 1887.

Glenn County: Having been in existence since 1891, only four years' funds appear.

Kings County: Having been in existence since 1891, only four years' funds appear.

Madera County: Having been in existence since 1891, only four years' funds appear.

Monterey County: On account of condition of records, it was found necessary to approximate road funds for years 1885 to 1892, inclusive.

Orange County: Organized 1889, and but seven years' funds have been collected.

San Benito County: On account of condition of records, it was found necessary to approximate funds for years 1885 and 1886.

San Bernardino County: Years 1885, 1886, and 1887 approximated.

San Luis Obispo County: Years 1885, 1886, 1887, and 1888 approximated.

Santa Barbara County: Practically no accurate data available, except for years 1894 and 1895. Accounts in such condition as to render it necessary to approximate amount of road funds collected from 1885 to 1894.

Besides the amounts herein shown, many counties have expended large amounts of money out of the General Fund for the construction of bridges.